The Right. Hon.ble Charles Lord Viscount Townshend.

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JOURNAL

OF THE

ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

CHARLES, SECOND VISCOUNT TOWNSHEND.

The portrait which serves as a frontispiece to this Volume is taken from an engraving after Sir Godfrey Kneller of Charles, second Viscount Townshend, who holds a distinguished position amongst the pioneers of British Agriculture. The full inscription below the print is "*The Right Hon^ble^. Charles Lord Viscount Townshend. G. Kneller S. R. Imp. et Mag. Brit. Baronet^s^ Pinx. J. Simon fecit. Cum privilegio Regis. Sold by E. Cooper at the* 3 *Pigeons in Bedford Street.*"

Charles Townshend, who succeeded his father as second Viscount Townshend when he was only ten years of age, was born in 1676. He died in 1738. His place in the history of British farming is described in a subsequent article, but the following personal details concerning him may be of interest.

As a statesman he filled a prominent position at a critical period. As early as 1702 his political consequence was such that he was named as Lord Privy Seal in a Whig Administration which William III. endeavoured to form shortly before his death; in 1705 he was appointed one of the Queen's Commissioners to treat for the Union with Scotland; and in 1709, as joint plenipotentiary with Marlborough, he signed the Peace of Gertruydenberg. In the same year he became Ambassador at the Hague, and in that capacity negotiated the famous Barrier Treaty.

In 1714, on the accession of George I., he became Secretary of State and in effect Prime Minister. Two years later, for

reasons which need not be dealt with here, the King determined on his dismissal; but, in order to soften the blow, was induced to offer him the Lord Lieutenancy of Ireland. This, however, was refused in a letter in which indignation was veiled by sarcasm. "I am highly sensible," he wrote to the King, "of the honour which your Majesty confers on me by condescending to appoint me Lord Lieutenant of Ireland; but as my domestic affairs do not permit me to reside out of England, I should hold myself to be totally unworthy of the choice which your Majesty has been pleased to make, if I were capable of enjoying the large appointments annexed to that honourable office without doing the duty"[1]—the fine irony of this passage being aimed at Sunderland, who had filled the post since the King's accession, but had never set foot in Ireland during his tenure of office.

Lord Townshend's dismissal was, however, so markedly unpopular that the King afterwards prevailed upon him to accept the Lord Lieutenancy as a temporary post until a more important one could be found, but in 1717 political combinations and intrigues resulted in his second overthrow. But only for a time. In 1720 he became President of the Council, and shortly afterwards joint Secretary of State with Walpole. For the next few years he was virtually Minister for Foreign Affairs, and was frequently absent from England in attendance on the King.

In 1730 his political vicissitudes were brought to a close by his final resignation of office. He immediately betook himself to his seat at Rainham, and never again returned to London, "in spite," says Lord Stanhope, "of the most flattering advances from the Opposition, who were prepared to receive him with open arms."[2] Thenceforward, until his death in 1738, he devoted himself to the management of his Norfolk estates, to experimenting in the farming practices which he had observed abroad, and, above all, to the field cultivation of turnips, and to improvements in the rotation of crops. So zealous was his advocacy of root culture that he was generally known by the sobriquet of "Turnip Townshend," and supplied Pope with an example for his Horatian illustrations:—

> Why, of two brothers, rich and restless, one
> Ploughs, burns, manures, and toils from sun to sun;
> The other slights for women, sports and wines,
> All Townshend's turnips and all Grosvenor's mines,
> Is known alone to that Divining Power
> Who forms the genius in the natal hour.

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[1] Coxe's *Memoirs of Sir R. Walpole*, vol. i. 191.
[2] *History of England from the Peace of Utrecht*, vol. ii. c. xv.

His own Norfolk property was then covered with rush-grown marshes, or sandy wastes, where a few sheep starved, and where "two rabbits fought for every blade of grass." Six hundred thousand acres of the neighbouring county of Lincoln were either fens, or unfenced, unproductive heaths. His enlightened and far-reaching improvements converted both counties from furze-capped rabbit-warrens into corn manufactories and sheep and cattle markets.

Lord Townshend was one of the first great landlords who studied the best means of improving their estates. He reintroduced the ancient, but almost obsolete, practice of marling the light lands of Norfolk. He encouraged the increase of enclosure. He tapped a new source of agricultural wealth by the experiments which he adopted in the field cultivation of clover and turnips. Following in the lines laid down by Jethro Tull, he pursued that eminent agriculturist's system of drilling and horse-hoeing turnips, instead of sowing them broadcast. He initiated the Norfolk, or four-course, system of cropping, in which roots, grasses, and cereals were judiciously alternated. His land was unexhausted by excessive cropping; it was enabled to carry more stock; he had more manure at command; and the sandy soil of the county, at once refreshed, fertilised, and consolidated, yielded treble its former crops.

He was described by a political opponent as a man of impracticably violent temper, impatient of contradiction, captious, obstinate, implacable. But even Lord Hervey does not impugn Townshend's honesty. He was one of the few incorruptible statesmen of his day. In a time of general licence, he was a good husband and a good father. There is a ring of honest passion in his answer to Walpole's insinuations against his moral character—"No, Sir, I am not one of these fine gentlemen who find no time of life, nor any station in the world, preservatives against follies and immoralities that are hardly excusable when youth and idleness make us most liable to temptations." As Lord Cathcart observes in his biography of Jethro Tull, in the last volume of this Journal, "In an age of corruption, Townshend passed his public life in handling political pitch, yet finally retired into private life, with hands clean and undefiled."

R. E. Prothero.

LANDMARKS IN BRITISH FARMING.

Rural life, six centuries ago, offered many picturesque and striking contrasts to its most familiar aspects at the present day. Yet, up to 1760, the mediæval peasant would still have felt himself at home in his ancient village, and on his former holding. The system of farming had remained the same; the crops, rotations, live-stock, and land management were as yet unaltered. More change has taken place within the last 130 years than resulted from the whole previous period since the Norman Conquest. Necessity proved the mother of agricultural improvement. The rapid growth of a manufacturing population revolutionised the face of the country with the suddenness of an earthquake. Farmers who had been satisfied with a domestic industry, which supplied their own wants, woke one morning to find themselves forced to become manufacturers of bread and meat for millions in the towns. It became necessary to extract the utmost from the soil, and, though some social results of rural changes may be of doubtful benefit, the advantages which the nation reaped from the development of farming skill are as enormous as they are also indisputable. A brief sketch of the most salient features in the history of agricultural progress forms the subject of this paper.

Our starting-point is a village farm in the twelfth century. Archæologists and historians find interesting fields for study in the origin of those associations of tillers of the soil. One group of writers sees in them the primary cells of the political organism; another attributes their existence to a development from the Roman system of estate management. For the present purpose it is enough to say that, after the conclusion of the Anglo-Saxon conquest, the country was covered with a network of agrarian communities, whose members had passed from the migratory stage of subsistence on the chace or flocks and herds, into the stage of tillage and permanent settlement. Each social group of co-partners was self-supporting and self-sufficing. Within the limits of each clearing were concentrated all the necessaries of life, and all the crafts, trades, and occupations that were requisite for complete independence. Traces of these primitive settlements are indelibly preserved in local nomenclature. Words like dens, holts, woods, hursts, folds, indicate the outlying forests which formed the boundary of the clearing; within its limits, the hams, tons, worthys, stedes, designate the sites of the settled habitations.

In the twelfth century, the soil of England was still cultivated by similar associations of agricultural partners. They had altered few of their external characteristics. Each group was isolated and self-sufficing. With the outside world, except for the purpose of salt, iron, millstones, and tar, it held little or no communication. The fields and live-stock provided the necessary food and clothing; the wastes supplied timber for building, fences, or fuel; each manor had its mill, its bakehouse, and its brewery. Women spun wool into coarse cloth; men tanned their own leather. Highway rates were unknown; wheeled carriages were scarcely ever used; and, except the great main tracks, roads hardly existed. The drift lanes, more or less impassable, which communicated between the village and the cultivated land, and ended when the bounds were reached, could only be called roads by courtesy. One important change had, however, taken place. Each village, in the normal state of things, formed, with its adjoining land, a manor. In other words, one individual, called the lord, possessed valuable rights over all the other inhabitants, and over all the soil, of the district. The benefits of the new relations were reciprocal. Feudal society was organised on the basis of local jurisdiction; neither central power nor law secured independence for the weak. Dependence was the strength and protection of agricultural labourers. Tenants were rarely introduced from the outside. From father to son the same families cultivated the village fields. The manor courts provided for the maintenance of order, the transfer of land, the administration of justice.

The land of the manor was divided into two parts. One third consisted of the demesne land, or lord's farm; two thirds were lands allotted to the free tenants, villeins, and cottars. Upon the demesne lands a few slaves were the only permanent labourers. But over the whole estate there existed an elaborate system of joint labour, by which the soil was cultivated. At the present day money payments constitute the whole of the rent of the land. In the twelfth century they formed a subordinate part. Labour-dues were the chief conditions by which land was occupied. They differed in each manor. But they fall under three main heads; firstly—precarious, uncertain—week-day services throughout the year; secondly—fixed, certain—annual services of spring and winter ploughings, and of harvesting; thirdly, payments in money or in kind. In all probability the lord's demesne was almost universally thrown into the common farm. The whole was tilled together. The lord's interests were protected by the bailiff, whose duty it was to know exactly the services which were due from each tenant—

at what season, and with how many oxen, each free tenant or villein was bound to assist in making up the plough teams; to see that the oxen were yoked at the proper time; to take care that they were not cast off till the full day's work was done; to sow the seed with his own hand; to superintend the various agricultural operations; and, in brief, to direct the whole work of the farm, and the whole staff of agricultural labourers.

Most of the work on the lord's demesne was performed by the labour services of the tenantry. Ploughing and reaping were the most important of these obligations. On ploughing days the tenants met the lord's officers at early dawn. The cottars came without oxen, and were probably set to work at delving, or breaking the clods with beetles. The free tenants and the villeins came with one, or two, or even four oxen, according to the size of their holdings. Similarly, on reaping days, each tenant, according to the size of his holding, either sent men, or came himself to the harvest. Sometimes the services of the whole family, except the housewife, were required. Harvests were days of merry-making.

> In tyme of harvest mery it is ynough;
> The hayward bloweth mery his horne,
> In eueryche felde ripe is corne.

The season meant the return of plenty after months of scarcity, and the harvest was followed by a feast provided by the lord of the manor. Lammas-day, or Loafmass-day, was so called because a thanksgiving mass was celebrated for the firstfruits of corn. The obligatory services of the tenants were one of the chief pecuniary values of the manor. The tenants felled, hauled, prepared, and put up the timber of which the lord's house was built. They erected and repaired his granaries and ox-sheds; they kept the few fences in order; they maintained the mill-pond and the weir. They ploughed, manured, harrowed, weeded, and sowed his land; they reaped, stacked, and threshed his corn; they mowed and carried his hay; they supplied him with beasts of burden and of draught.

The whole farm, whether demesne or tenantry land, was tilled upon this system of joint labour. The farmers of the separate plots did not live upon the land they cultivated: consequently there were no farm-houses and no separate labourers' cottages. All the cultivators of the land were bound to the soil; none could leave the manor without payment of a fine. No social gaps separated agricultural labourers from tenant-farmers. All were holders of land together; all were compelled, even from the lord downwards, to follow the same system of joint cultivation, to plough, sow, and reap at the same time. All the

partners in the common venture of the farm were gathered together into wooded dwelling areas. In an enclosure of trees, which rose out of a bare, hedgeless clearing, was placed the village. The street, the church, the parsonage, stood much as they stand now. On either side of the street dwelt the cultivators of the soil. The more substantial peasants, who held from fifteen to thirty acres of arable land, and were the owners of one or more oxen, lived in houses, which were surrounded by outbuildings, and small yards "fencèd al aboute with stikkes." Their poorer neighbours, who owned no oxen, and rarely held more than from two to five acres of the arable soil, had no outbuildings or crofts.

Village life was at once different and similar to that of our time. Agricultural writers who look at the surface of things, notice that the village merry-makings, rush-bearings, May-games, summering at St. John Baptist's Eve, have ceased, and therefore conclude that the people are now less prosperous than heretofore. Precariousness of livelihood, alternations between feasting and starvation, droughts, scarcities, famines, crime, violence, murrains, scurvy, leprosy, typhoid diseases, wars, pestilences and plagues would tell a different tale. The dwelling-houses were of the meanest description. A few boards, and a load of mud, mixed with leaves, moss, or straw, formed the walls of the hovels; a few bundles of rushes, reeds, or heather, provided the thatch. Inside there was no plastering, no floor, no ceiling, no chimney, no fireplace, no bed. Sometimes a hurdle divided the single room, in which the owner and his family ate, slept, lived and died, and into which the live-stock were gathered for refuge. More often men, women, children and pigs, turned themselves round together on the floor, while "Chanticlere," with "Damysel Pertilote," and his other wives, roosted on rafters that were always sooty from the smoke escaping through the roof. Dark, unsavoury, unhealthy, the hovels of the peasantry offered no domestic comforts.

Then, as now,—but with greater excuse,—the rural population was attracted elsewhere. Alehouses, distinguished by ale-stakes, or by signs, were extraordinarily numerous. Here gathered together all the men and women who could afford a halfpenny for a gallon of ale, or who had any clothing or property to deposit in payment of their score. "Till evensong," and not seldom until matins, parish clerk and cobbler, hedger and rag-picker, delver and curate, sang, and drank, and swore, and gambled together. From the earliest times, Englishmen were famous as "potent at potting." In the sixteenth century their habits had passed into a proverb. Rabelais uses "ivre comme

ung Anglais" as a byword, though his English translator is patriotic enough to translate it "drunk as a Switzer." These alehouses were generally kept by women, like Elynour Rummyng, who, as the word "brewster" denotes, brewed the ale they sold. Then, as now, the consumers were often defrauded. At every manor court the official ale-taster presented the "tipplers," or ale-sellers, for the use of false measures or adulteration of their wares with salt and other provocatives of thirst.

The house and homestead of the peasantry were originally the only permanent enclosures, and the only property which they could be said to hold in separate ownership. The rest of the village land was held and farmed in common. It consisted of three portions—arable land, meadow, and pasture.

All round the village lay a bare expanse of arable land, generally divided into three huge fields. One of these fields was sown with wheat or rye; another with barley, oats, beans, or pease; the third lay fallow. The whole was cultivated according to the same unvarying triennial rotation. Each of the three fields was cut up into "furlongs," and subdivided into acre or half-acre strips, separated from one another by rough, bush-grown balks, or "dooles," of unploughed turf. The complete holding of each villager was so divided that each man had a third of his land in each of the three fields, and the three bundles of strips so allotted did not lie together, but were separated and intermixed in order that all might receive their due proportion of good or bad land. Thus, supposing John Nokes to hold thirty acres, ten acres would be in the wheat field, ten in the barley field, ten in the fallow field, and the ten acres in each field would be divided so that no two were contiguous. From seed-time to harvest, the strips were fenced off for the benefit of the individual to whom they belonged. After the crops were cleared, the fences were removed; common rights were revived; and the cattle of the village wandered promiscuously over the whole.

Besides the arable lands, there were the meadows, which were annually assigned to the use of individuals from Candlemas to Midsummer Day, and for the remainder of the year were pastured in common. Beyond the arable and meadow lands lay the roughest and poorest land, which was left uncleared and in its native wildness, affording timber for building, fencing, or fuel, mast and acorns for swine, rough pasture for the ordinary live-stock, and rushes, reeds, and heather for thatches, ropes, beds, and a variety of other uses in the farm or the house.

This is the plan upon which the arable soil of England was mainly cultivated down to the middle of the eighteenth century, and which has only expired within the last few years. In 1764, out of 8,500 parishes 4,500 were still unenclosed, open-field farms, cultivated upon a co-operative system of agriculture which, as compared with the thirteenth century, either remained stationary or actually retrograded. Take, for instance, the example of a common-field farm in Wiltshire at the beginning of this present century. Little change has taken place. The village farm is a self-sufficing whole, a common household, in which each member contributes to the general venture, gets his own living, and with that remains content. In shape, open-field farms in Wiltshire were generally a long narrow oblong, hemmed in between the foot of the downs and the river, stretching often for three miles in length. At one extreme end stands the cluster of mud-built, straw-thatched cottages, each with its yard, or small pasture, for horses, calves, or field oxen, fenced in by hedges that are dotted with trees which betray by their maturity the antiquity of the enclosures. Elsewhere the land is bare of farm-buildings, labourers' houses, or even hedges. In the twelfth century most of the holdings were of equal size, value, and tenure; in the nineteenth, they admit in every respect of infinite variety. All the partners in the village farm enjoy certain rights in common, and consequently all the land is still farmed by the whole community together, although one holding may be freehold, another copyhold, a third held on leases for lives, a fourth rack-rented. The average size of a single holding is eighteen acres of arable land and two acres of meadow, together with common rights, on the common field, meadows, and other commonable places, for forty sheep, and as many cattle as the holder can fodder in the winter months. But each holding is cut up into minute, scattered, and distant portions. Thus, in 1794, a farmer at Wendover in Buckinghamshire held eighteen acres of arable land, divided into thirty-one separate parcels.

The land of the village farm consists of meadow, tillage, and pasture. Next to the houses and enclosures, and fringing the river bank, lie the meadows, which are allotted in separate ownership from Lady-day to hay harvest, when they revert to common. Beyond the meadows lie the three tillage fields, running up into the downs till the soil is too thin and steep for the plough. The arable parcels of which each holding consists are made up of separate intermixed ridges of the crooked, old-fashioned sort, gathered up high in the crown for the sake of drainage. They are held in separate ownership from the preparation for the

summer crop till the harvest, when they are grazed by the flocks of the village in common. Beyond the meadows and the tillage land begin the sheep common and the cow-downs. Sheep are kept for their wool rather than their mutton, and cattle are valued for their milking qualities, or their power of draught. The common shepherd drives the sheep of the commoners to the downs, or folds them in the common fold upon the arable land, or, when they require to be fed, pens and feeds them in separate lots, each commoner finding his own food and fold. On the cow-downs the common herdsman tends the cattle of the community. They begin to feed on the downs in May, and continue to graze there till the meadows are mown, and the crops are cleared from the arable fields. Then they are turned in upon the aftermath, the haulm, and the stubble. Consequently they are fattest at Michaelmas. For this reason, as well as because it is necessary to diminish the live-stock during winter, when food is scarce upon open-field farms, they are slaughtered at the wane of the year, and salted for the Christmas provision. In the height of summer the cattle feed in the small marshes by the river, or along the sides of the lanes, or are tethered on the turf balks, and are only driven to the cow-downs after the evening milking. The rams and the parish bull are provided at the joint expense of the community, which also pays the wages of the shepherd and the herdsman.

The disadvantages, from an agricultural point of view, of the open-field, common, or intermixed system, are obvious. No open-field farmers could farm with spirit. Unless all moved together, no one could move hand or foot, and what was every man's business was no man's business. They could make no use of improved methods of cultivation, new crops, better live-stock, or mechanical invention. The land could not be appropriated to the particular use for which it was best adapted; it was cut up and wasted in footpaths to the different closes. Lawsuits were almost continuous; a turn of the plough robbed a neighbour of his land, and Dandie Dinmont's litigation illustrates how fruitful a source of ill-feeling were the "marches" of another's property. Cross-harrowing or cross-ploughing was impossible, because the strips were too narrow. Farmers, who had to traverse the whole length of the parish to reach the different parcels of their holdings, wasted their time, destroyed their harness, wore out their horses, or, as was the more general practice, neglected their land. No drainage could be effected unless the universal assent of all the co-partners could be obtained; if one man drained his land or scoured his courses,

his neighbour blocked up the outfalls. Consequently, the arable land was rarely cleaned; choked with docks and thistles, overrun with rushes and nettles, pitted with wet places, pimpled with ant-hills and mole-heaps, it made the minimum return for the maximum seeding. Turnips and clover could not be adopted, unless a large body of ignorant, prejudiced, suspicious co-proprietors agreed together to leave the beaten track in which their ancestors had plodded. No individual, even if he had possessed the genius of Bakewell, could improve his live-stock, since infectious diseases were rarely absent from the promiscuously-herded, half-starved cattle of the community, and the scab was rarely absent from the common fold, or the rot from the ill-drained field.

Yet, in spite of these disadvantages, it is probable that, so long as the land was only required to provide for the wants of the tillers of the soil, custom would have preserved the wasteful open-field system. The agricultural progress of six centuries may be practically summed up in the change from open-field farms to enclosed holdings, or in the transition from farming as a domestic industry to farming as a manufactory of bread and beef for the million. It is the history of a good machine driving out a bad one.

In this progress, four periods are most conspicuous: (1) 1230–1310; (2) 1485–1600; (3) 1760–1815; (4) 1845–73. Each of these four periods has its distinctive feature. In the first, serfdom and slavery die out, and the relations of occupiers to owners of soil assume more modern aspects. In the second, feudal dependence yields to commercial independence; retainers give place to sheep; self-sufficing farming loses its absolute supremacy; farming for profit begins. In the third, tillage supplants pasture; bread and meat become more important than wool; agriculture as a domestic industry disappears before the agricultural factory; commons, wastes, open-field farms, are replaced by the new system of enclosures, reclamation of wastes, consolidation of holdings, capitalist landlords and tenants. In the fourth, science is applied to agricultural practice; the new system is perfected, and adapted to new requirements; high farming is adopted and generally diffused. The intervals between these periods are, with the exception of the first sixty years of the eighteenth century, periods of agricultural or social distress. They are also periods of transition, preparation, theoretical discovery, local improvement, and accumulation of stores of experience by which the recovery and progress of farming in the next period are promoted and secured.

First Period—1230 to 1310.

What distinguishes the open-field farm of the thirteenth century from its twelfth-century predecessor, or its eighteenth-century descendant? Agricultural improvements are few, and strictly local. From William the Conqueror to George III. farming skill made little progress. The changes on open-field farms were social and economic; they consisted in different relations between tillers and owners of the soil, in the growth of freeholders, tenant-farmers, copyholders, and labourers for hire. On the twelfth-century farm, the cultivators of the soil consisted of four classes. A few free tenants held their land by small money rents, by nominal gifts like a gillyflower or a rose, or by military service; and rendered, in person or by deputy, fixed, definite services at the two special seasons of the autumnal and Lenten ploughings, and the three harvests of hay and corn. The two next classes were serfs. The villein held his land by definite yearly, and uncertain weekly, labour services, as well as by small payments in kind; the cottar's tenure was the same, except that his obligations of weekly and yearly labour were more precarious, less definite, and less important. Their serfdom consisted in the uncertain labour-rent, and in such incidents of their tenure as the prohibition to sell oxen, the obligation to pay fines for the marriage of daughters, the necessity of obtaining licences to leave the manor. Finally, there were a few slaves who were employed upon the demesne land. Out of these four classes emerged, during the period 1230–1310: the small freeholder, the copyholder, the customary tenant, the tenant-farmer, and the agricultural labourer.

The processes by which this change was effected were various. In some cases, the week-day work of the villein was commuted for fixed money rents, and only the definite services remained. In others, portions of the demesne land were granted as freehold for ever, or let off, at will or permanently, to free tenants for annual quit-rents in corn or money. In others, stretches of the waste land were cleared, and granted or let out on similar terms. As less of the demesne land was kept in hand, labour became less valuable to the lord, and he allowed the villeins to commute their uncertain personal services for money. Land tenure thus began to assume a more modern aspect. The old system was breaking up. Commercial interests, not humanitarian motives, accelerated similar changes in the condition of slaves. Mouths to feed, and hands without employment, were unprofitable to their owner. It was an advantage to the lord to emancipate his slave and to turn him

into a free labourer. Woodwards, cowherds, swineherds, ploughmen, shepherds, dairymen, became for the most part hired servants working for wages.

Thus the characteristic of the period under review is the growth of these agricultural classes. The first consequence of freedom is the creation of gaps between the different ranks of society. In the actual mode of cultivation the social change made little or no disturbance. Freeholders, tenant-farmers, copyholders, were still co-partners in the village farm, all equally bound by the co-operative system. Wherever open-field farms prevailed, the same method of cultivation was pursued. But some distinct advance in farming skill had been achieved. Originally, tillers of the soil scratched up new land, tilled it for successive crops, and, when exhausted, left it for other plots. The two-field system, by which the primitive practice was supplanted, interposed a fallow between each crop. In Lincolnshire in 1760, in the island of Portland in 1795, and in Gloucestershire in 1808, this dual system prevailed.

But from the reign of Henry III. onwards, the more ordinary practice was the three-field arrangement. Under this system the fallow field was twice ploughed, once in the summer between *Hoketide* (second Tuesday after Easter) and Lammas-day or *Vincula Petri* (August 15), and again in the autumn for the wheat-sowing. A third spring ploughing was introduced in the thirteenth century for wheat or rye. About Epiphany the wheat-stubble was ploughed for oats, barley, beans, or pease, and the crops were sown and harrowed in March or April. The barley, or oats, stubble lay fallow for a year, when the rotation began again with wheat or rye. No other crops were cultivated except a little flax or hemp. Roots or artificial grasses were entirely unknown. The only manure which the land received was from the sheep and cattle that were folded upon it between harvest and ploughing; but marling was extensively practised. All seed was sown broadcast, and the seeding was necessarily thicker then than now, since the land was often wet and generally foul. The average quantity of wheat sown was between two and three bushels to the acre. The return was from six to nine bushels. On the Berkeley estates great care was taken with the seed; it was changed each second or third year, and vale corn was transferred to upland soils and *vice versâ*. If the farmer received four times his seeding he was pleased, if three times, satisfied. It is not, however, probable that he expressed contentment. All the world over farmers are the same. In Spanish "parva" (little) means a heap of corn, so

called, says Pineda, because the farmer always thinks it less than it ought to be.

Considering that no winter keep was grown, the proportion of arable land was in excess of the grass. But the rough pasture must be taken into account. With his arable land, each tenant was entitled to a proportion of meadow and pasture. Thus, at Aston Boges, in Oxfordshire, in 1557, each complete tenancy consisted of 27 acres of arable land, 7½ to 8½ acres of mowing ground, and pasture rights for 8 oxen, or 4 horses, and 32 sheep. At Rothwell, in Northamptonshire, in 1797, the parish contained 3,000 acres. Six hundred acres consisted of enclosures near the village; 1,800 acres were thrown into three distinct fields of arable land, each field consisting of 600 acres; 600 acres were devoted to grass land. Each holding, or yardland, of which there were eighty, consisted of 30 acres; 22½ acres were arable; 2½ acres were meadow. In only two respects had the condition of the soil altered since the twelfth century. There were no labour services due to the lord of the manor, and the keep for stock allotted with each holding had increased. Formerly, it was two oxen, a cow, and six sheep; now it was 4½ head of cattle and 24 sheep. Similar instances in the eighteenth century might be quoted for nearly every parish in England. Few horses were employed on the farm. Oxen were less expensive to keep—in summer they required no hay or oats; in winter they would eat straw. Horse-harness was a perpetual rent-charge on the farm, and an expensive initial outlay. The yokes, bows, and chains of ox-teams cost less, and more rarely needed repair. The slow, steady draught of oxen was less liable to pull the plough to pieces against roots or stones. Oxen are not subject to a variety of diseases which attack horses; they require to be shod only on the forefeet; if they fall lame they are ready for fatting. And last, but not least, they could not be impressed for martial purposes, whether by the king or the manorial lord.

The best art of mediæval farming differed from modern times by its deficiencies. The land was ill-drained; the working of the soil was shallow; the crops were few and unvaried; a third of the land lay fallow; the manures employed were limited to the droppings of sheep and cattle, lime, marl, and sheep-dressing. As a science, agriculture was scarcely known outside the walls of monasteries. The monks alone knew Latin, and could read Cato or Columella. Palladius's treatise on agriculture was in the library of Christ Church, Canterbury, in the thirteenth century, and the monks of Glastonbury employed Johannes de Bruges to make a copy of the book for their use. An early

translation of the same work into English verse was extant in 1420. Grostête's version of Walter de Henley's treatise on husbandry, and the appearance of *Fleta*, which is a sort of landowner's manual and bailiff's *vade mecum*, attest the growing interest in agriculture as a commercial venture.

But during the period from the accession of Edward II. to that of Henry VII. [1307–1485], farming progress sustained a rude check. Long-continued foreign and civil wars, frequent famines, repeated outbreaks of plague and pestilence, diminished the supply of labour. As the demand exceeded the supply, hired labourers required higher wages. Landlords who had exonerated their tenants from personal services, and had commuted them for fixed money payments, found that they could no longer cultivate their own land with profit. They endeavoured to revert to the old labour dues, or to raise the quit-rents, in order to dispense with the necessity, or procure the means, of hiring agricultural labourers. Neither the attempt nor the resistance was unnatural. The famine price of food in 1379, and the poll-tax of the same year, brought the discontent of the industrial classes to a climax. One main object of the insurrection of Wat Tyler was the destruction of the Court-Rolls, which contained the legal evidence of the labour-rents of copyholders and customary tenants. No sooner was the rising suppressed than the attempt was made to adjust by statute the disturbed relations between capital and labour. Fresh outbreaks were only averted by the Wars of the Roses, and by the dawn of the new era which was established at the accession of Henry VII.

Second (Tudor) Period—1485 to 1600.

The population had dwindled in the 180 years which preceded the battle of Bosworth Field. During the Wars of the Roses, villages had been plundered and burned, lands devastated, labourers killed, farms abandoned. Gardening died out under the stress of Civil War. Queen Catharine, in the reign of Henry VIII., was obliged to send to Flanders for a salad. Onions and cabbages were found in the ploughman's broth in the thirteenth century; they were, in the reign of Henry VIII., chiefly imported from the Continent. The sister art of agriculture was at a still lower ebb. Rentals of farms had declined nominally, and to a greater extent really, upon the rates of the thirteenth century. Arable land fetched half as much as meadow land. The scarcity and expense of labour, the number of fallows, the unvarying rotation of unenclosed farms, the small return of corn per acre, the difficulty of procuring manure, the

exhausted fertility of the soil, all pointed to a considerable change in methods of cultivation. The break-up of feudalism tended decidedly in the same direction. It was more the interest of Tudor landlords to multiply rents than retainers. Fitzherbert, in his treatise upon *Surveyinge*, holds a brief for enclosures. But, even with this fact in our minds, it is significant that he estimates an acre of common on a hill-side, sprinkled with gorse and furze, as equal in value to two acres of arable land.

The two great changes which were effected in this period were (1) *the exchange of enclosed for open-field farms*; (2) *the conversion of arable land into pasture.*

The first inroad was made on open-field farms. Enclosures became common. Lords of manors not only withdrew their demesne lands from the common farm, but also enclosed their wastes. The process was often high-handed; it had been originally adopted for sporting purposes. Maurice, Earl of Berkeley in the fourteenth century, anticipated the movement, which did not become general till 150 years later. He had a wood called Whitclyve Wood, which "hee fancieth to reduce into a parke." He treated with his tenants and freeholders for the exchange or sale of their lands, and with the commoners for the purchase of their rights of common.

After some labour spent, and not prevailinge to such effect as hee aymed at, he remembereth, as it seemeth, the Adage *multa non laudantur nisi prius peracta*; "many actions are not praiseworthy till they bee done." Hee therefore on a sodaine resolutely incloseth soe much of each mans land into his sayd wood as hee desired; maketh it a parke, placeth keepers, and storeth it with Deere. And called it, as to this day it is, Whitclyve Parke. They seeing what was done, and this lord offeringe compositions and exchanges as before, most of them soone agreed, when there was noe remedy. And hee soone after had theire grants and releases of land and common as hee at first desired *unguentum pungit pungentem rusticus ungit*; "it is not for a Lord too long to make curtesey to the clowted shoo." Those fewe that remayned obstinate, fell after upon his sonne with suites to their small comfort and less gaines.[1]

The practice of enclosures was now adapted not so much for hunting as for profitable farming. Common rights, upon which the very existence of agrarian associations depended, were extinguished by force or by mutual consent. Manorial estates were consolidated, partly by the withdrawal of the demesne from the common farm, partly by the enclosure of wastes. Many of the agrarian partnerships were thus dissolved. The joint system of co-operative farming was also

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[1] *Lives of the Berkeleys.* By John Smyth of Barton. Bristol and Gloucester Archæological Society. 1883. 4to.

invaded by another process. Not only among landlords, but also among freeholders and copyholders, the tendency set in the direction of individual, instead of common, occupation. Bundles of scattered strips in open-field farms were exchanged for compact blocks. Where the agrarian associations continued, their farming deteriorated, because the landlord's officers ceased to direct the common farm. Large freeholders benefited by the change, while substantial tenants derived advantages from the consolidation of their holdings. It was upon the smaller yeomen and tenantry, and upon the hired labourers, that the effect of enclosures, combined as it was with the conversion of arable land into pasture, told with most severity. Their holdings, or their wages, proved too small for their support when their common rights were extinguished.

The process of enclosures received fresh impulse from the growing wool trade. Money was to be made by wool. But sheep could not be herded with success upon commons, and small holdings were incompatible with large flocks. The new commercial aristocracy turned flockmasters, encroached upon, or enclosed, the commons, and evicted small tenants from their holdings, that they might increase the size of their pasture farms. One shepherd was employed where half a dozen labourers had worked on arable land. The demand for labour dwindled. In vain the Legislature endeavoured to check the progress of the change, which the dissolution of the monasteries powerfully accelerated. The sufferings of the rural population found expression in the numerous agrarian insurrections of the sixteenth century. Wage-earning labourers out of employment, tenant farmers evicted from their holdings, small freeholders ruined by the loss of the commons, swelled the cry of the people. In a quaint dialogue between the husbandman, the knight, the capper, the merchant, and the doctor, the husbandman thus gives voice to their complaint:—

> "Inclosures do ruin us all; all is taken up for pasture—for pasture either for sheep or for grazing of cattle; in so much that I have known of late a dozen ploughs, within less compass than six miles about me, laid down within this seven years; and where three score persons or upwards had their livings, now one man with his cattle hath all. Sheep have driven husbandry out of the country, by the which was increased before all manner of victual, and now altogether sheep, sheep, sheep."[1]

The immediate results of enclosures, and the conversion of arable land into pasture, were disastrous to the lower ranks of the rural population. Yet it cannot be denied that the change

[1] *A Compendious or Brief Examination of Certain Ordinary Complaints of Divers of our Countrymen in these our Days.* By W. S., Gentleman (Wm. Stafford). 1581.

was a necessary preliminary to agricultural progress. Without enclosures, and individual occupation, no advance could be effected. Towards the end of the reign of Elizabeth, the equilibrium was re-established between labour and capital. An extraordinary impulse was given to the study of the practice of farming. Before the sixteenth century no agricultural literature existed. Within the period from 1523 to 1600, Fitzherbert, De Benese, Malbie, Hill, Tusser, Scot, Googe, Plat, Lambard, Partridge, and several others, had all written upon farming topics. Googe mentions thirteen other writers, whose works have perished. Substantial farmers profited by the low wages of hired labour and the high prices of agricultural produce. Harrison mentions their growing luxury, and the chimneys, beds, sheets, pillows, pewter, tin, and silver which now for the first time found a place in their houses. Sir John Oglander notices a change in the Isle of Wight which was universal throughout England. "Money," he says, "was as plentiful in the yeomen's purses as now in the best of the gentry, and all the gentry full of money, and out of debt."

It was under the stimulus of enclosures that an attack was made upon the forests, fens, heaths, and marshes, which still occupied the greater part of England. In the southern counties, the forests of Sussex, Wilts, Hants, Dorset, had shrunk in extent. But from Lincoln to the Mersey, and northwards from the Mersey to the Solway and the Tweed, there stretched an unbroken line of swamp and woodland. Here and there patches of corn-land and pasture, surrounding remote parishes, towns, and monasteries, broke the sweep of forest. Between the Thames and the Trent lay the best cultivated and most fruitful districts of England. Norden calls Essex the "Englische Goshen, the fattest of the Lande; comparable to Palestina, that floweth with milke and hunnye." So "manie and sweete" were its "commodities," that they compensated for "the most cruell quarterne fever," which he caught in its low-lying fields. Suffolk was famous for its "Punches" and its dairy producc, and, like Essex, was early enclosed. The superior cultivation of these two counties is alleged in proof of the advantages of enclosures; drainage, marling, and manuring were extensively practised; ploughing was economically conducted; horses, and not oxen, were generally employed. The other eastern counties were to a great extent under water; "the Aer nebulous, grosse, and full of rotten Harres; the water putrid and muddy, yea, full of loathsome vermine; the Earth spuing, unfast, and boggie; the Fire noysome turfe and hassocks; such are the inconveniences of the Drownings."

Considering that the area of forest-lands was but little re-

duced,—that the fen districts, which were seventy miles long, in places thirty miles broad, and covered 680,000 acres, had once been well-drained and fruitful,—that sheep were kept, not for mutton, but for wool,—that the agricultural practices of the open-field farms had deteriorated,—that the natural fertility of the soil was exhausted,—it is probable that the capacity of England to produce food for her population was scarcely greater in 1600 than it had been in 1310.

The period of 160 years which intervened between the death of Elizabeth and the accession of George III. was, speaking generally, a period of theoretical and local improvement. The promise of progress was blighted by the civil commotions and social distress of the seventeenth century, while the material prosperity of the first half of the eighteenth century deprived agriculturists of their energy and enterprise. But in this transition stage stores of agricnltural wealth were accnmulated, first in theory, and then in local practice. The history of both has been so admirably told in Lord Cathcart's recent monograph on Jethro Tull,[1] that it is needless to repeat the details.

At the opening of the seventeenth century manifold signs appeared of coming improvement. Numerous writers were studying the art and practice of farming. Enclosures offered the opportunity for the introduction of new crops and new methods. Better means of communication were provided. New materials for agricultural wealth were within reach; turnips were already grown in English gardens; clover had been urged upon English farmers. Increased attention was paid to manuring; the merits of Peruvian guano were explained by G. de la Vega at Lisbon in 1602; liming and marling, practices which had died out since the fourteenth century, were revived. Schemes were on foot to drain the fens; practical advice was given upon the reclamation of waste lands. Attention was paid to the improvement of agricultural implements. Patents were taken out for draining machines (Burrell, 1628), for new manures (1633, 1636, 1640), for improved courses of husbandry (Chiver, 1637), for plonghs (Hamilton, 1623; Brouncker, 1627; Perham, 1634), for mechanical sowing (Ramsey, 1634; Platt, 1639). Fresh energies were infused into agriculturists. On every side brighter prospects seemed dawning for English farming.

But practical progress was once more checked for more than a century by the Civil Wars and political changes of the seventeenth century. Agriculture languished, if it did not

[1] Journal R.A.S.E., Vol. I. (3rd Series), Pt. I., 1891.

actually decline. Not more than six patents were taken out between 1640 and 1760. Yet if the period from 1600 to 1760 was comparatively barren in performance, it was rich in preparation.

Most of the subsequent improvements of 1760–1815 were locally applied with success. In point of material comfort this period was the Golden Age of the agricultural classes. More produce was raised from the soil, and England turned from the growth of wool to become the granary of Europe with a large export trade in corn. Population increased more slowly than the productiveness of the soil. The poor rates fell, the purchasing power of wages rose, the standard of living improved among all classes. No great civil war disturbed the prosperity of the period. The darkest sides to the picture were the terrible outbreaks of rot in 1735 and 1747, and the cattle plague which three times in quick succession travelled from Bohemia through France to England. Ellis (Shepherd's *Sure Guide*, 1749) gives an account of the devastation caused by the rot in 1735. He speaks of it as

> the most general one that has happened in the memory of man, because it rotted those deer, sheep, lambs, hares, and coneys, that fed on lands where rain-waters were retained on or near the surface of the earth for some time; and the dead bodies of rotten sheep were so numerous in roads, lanes, and fields, that their carrion stench and smell proved extremely offensive to the neighbouring parts and to passant travellers.

In the first sixty years of the eighteenth century landlords began to take the lead in agricultural improvements; Scotland awoke from a lethargy which had allowed farming to remain unchanged since the Battle of Bannockburn; enclosures went on apace, and the area of uncultivated ground was diminished; Jethro Tull conducted his experiments in the drilling of turnips and in agricultural machinery; Townshend practised the Norfolk, or four-course, system of husbandry, which made clovers and turnips the pivots of English farming; Bakewell commenced those experiments in stock-breeding that created the grazier's art. Each of these points might well repay separate treatment. Here they can only be briefly handled.

The landlord whose name is most intimately associated with the agricultural changes of the period, was Lord Townshend, whose devotion to turnips gained him the nickname of "Turnip Townshend." But other landowners, among whom Lord Ducie was conspicuous, interested themselves in the cultivation of the soil. The eccentric Lord Peterborough was devoted to farming. He was also an enthusiastic gardener. His gardens, which covered twenty acres at Parsons Green near London, were filled with rare fruits, flowers, and plants. His daughter, Lady

Elizabeth Mordaunt, who married the eldest son of the Duke of Gordon in 1706, inaugurated the improvement of Scotch farming; she introduced the practice of fallowing, and English ploughs and ploughmen. Lord Bolingbroke, as the leader of the Country Party, posed as a farmer. "Tup Harry is Mutton-Master," is the announcement in the *Hyp-Doctor* for 1731. Dawley Farm (Bolingbroke's residence), it adds, "has long been famous for a great Cry and little Wool." Even Pope loved "to play the politician among cabbages and turnips."

The improvement which was effected in Scotland was no less great than tardy. When Ray the botanist visited the east coast of Scotland in 1660, he noticed that there was "little or no fallow ground in Scotland. The men seemed to be very lazy." "Their houses are pitiful cots. They have neither good bread, cheese nor drink. They cannot make them, nor will they learn." Alexander Garden of Troup describes the method of farming in 1683. The land was divided into infield and outfield. The infield was kept "constantly under corne and bear, the husbandman dunging it every thrie years, and, for his pains, if he reap the fourth corne he is satisfied." The outfields were allowed to grow green with weeds and thistles, and after four or five years were twice ploughed and sown with corn. Three crops were taken in succession, and then, when the land no longer repaid seed and labour, it was allowed to revert to its weeds and thistles. Sir Archibald Grant of Monymusk, in Aberdeenshire, says that, in 1716, turnips in fields grown by the Earl of Rothes and a few others were objects of wonder, that wheat was confined to East Lothian, that there were few enclosures, no repaired roads, few wheel-carriages. On his paternal estate

> there was not one acre enclosed, nor any timber upon it, but a few elm, sycamore, and ash about a small kitchen-garden adjoining to the house, and some straggling trees at some of the farm-yards, with a small copse-wood not enclosed, and dwarfish, and browsed by sheep and cattle. All the farms ill-disposed and mixed; different persons having alternate ridges; not one wheel-carriage on the estate, nor indeed any one road that would allow it, and the rent about 600*l.* sterling per annum; grain and services commuted into money. The whole land raised and uneven, and full of stones, many of them very large, of a hard iron quality, and all the ridges crooked in shape of a S, and very high and full of noxious weeds, and poor, being worn out by culture without proper manure or tillage. The people poor, ignorant, and slothful, and ingrained enemies to planting, enclosing, or any improvements, or cleanness.

Improvements were close at hand. In 1633, Scotch landlords had been enabled to get their tithes valued, and to redeem them. In 1695 a Scotch Act had been passed for division of commons and consolidation of intermixed properties. In 1697 appeared the first, a Scotch, treatise on agriculture. Donaldson

begins his *Husbandry Anatomised*, by admitting that, though he taught others to farm, he had failed himself as a farmer. He recommends plentiful manuring, the housing of cattle, the increase of hedges and enclosures, the granting of long leases. Without "long tacks," he says that it is idle to expect improvements. "If a tenant improves his land the Landlord obligith him either to augment his Rent, or remove, insomuch that its become a Proverb (and I think none more true), *Bouch and Sit, Improve and Flit.*" He does not, however, expect that his advice will be taken. People will probably say to him, "Away with your fool Notions, there are too many Bees in your Bonet-case, we will satisfie ourselves with such Measures as our Fathers have followed hitherto."

The Union gave a great stimulus to Scotch agriculture. Between the cattle-lifters of the Highlands and the moss-troopers of the Border, Lowland farmers had enjoyed few incentives to good farming. Donaldson was followed by Lord Belhaven, whose *Countryman's Rudiments* was reprinted in 1723. Two years later, *The Society of Improvers in the Knowledge of Agriculture in Scotland* was instituted. In 1743, Maxwell, who edited the *Select Transactions* of the Society, describes the results of its labours in the past eighteen years :—

> The practice of draining, inclosing, summer fallowing, sowing flax, hemp, rape, turnip and grass seed, planting cabbages after, and potatoes with, the plough, in fields of great extent is introduced ; and, according to the general opinion, more corn grows now where it was never known to grow before, these twenty years past, than perhaps a sixth of all that the Kingdom was in use to produce at any time before."

The Earl of Stair took the lead in "improvements in Lucern and St. Foin, uncommon guests in our Climate and Soil, his Turnip, Cabbage, and Carrot Husbandry by the Plough." Other landlords followed in the same direction. Lord Hopetoun, Lord Cathcart, Sir John Dalrymple, Cockburn of Ormiston, Hope of Rankeilor, are among the best known pioneers of Scottish farming. At first the progress was slow. The tenants were without capital, and they followed uniform traditional practices. The croft land was ploughed for three years and rested one ; the field land was ploughed three years and rested three. It was difficult to move the John Trot genius of farming from this immemorial round. If a stranger was brought in who improved his land, he was called a land louper, threatened, intimidated, and frightened out of the country by incendiarism.[1]

When once the advantages of the new system were understood, the agriculture of Scotland improved with extraordinary

[1] See *Select Transactions of the Society of Improvers*, vol. ii. p. 371.

rapidity. Scotch farmers, like Dawson of Frogden, quickly recognised the value of scientific farming. Many of them, at the close of the eighteenth century, had visited England, and even penetrated into Flanders to study different practices of husbandry. Scotch landlords took an active and personal interest in the management of their estates. Among them Henry Home, Lord Kames, was the most conspicuous. His versatile intellect ranged over a vast variety of theoretical subjects. But his *Gentleman Farmer* (1776) embodied, in a clear readable form, his own agricultural experiences. Long leases were early introduced. Even where land was strictly entailed, leases could be granted for thirty-one years and upwards, without restrictions on arable cultivation (10 George III. c. 51. 1770. Improvement of land in Scotland). Farms and fields were from the first large. Farm servants were steady, regular, industrious, persevering. The Scotch banking system permitted considerable advances of capital to enterprising tenants. All these, and other causes, enabled Scotland to outstrip England. Whereas in 1700 Scotland lagged behind, in 1836 her enterprise and energy enabled her farmers to weather the storm which overwhelmed hundreds of English farmers. The parts were reversed—the pupil became, a century later, the teacher.

In England, enclosures began to increase. But, at this period, they were mainly confined to the reclamation of waste lands. Young had not yet begun his crusade against open-field farms. Two hundred and forty-five Acts were passed in the reigns of Anne, George I., and George II., and 328,177 acres were enclosed. In the Government organ of the *Hyp-Doctor* (No. 42), the progress of enclosures is alleged as a proof that England was never more prosperous than under the rule of Walpole :—

> The number of private Gentlemen in Britain of ample estates exceeds that of any Country in the World proportionably, and is far greater now than in the reign of Charles II. The value of Land at 26 or 27 Years Purchase is a Proof of the Wealth of England; so likewise is the encrease of Enclosures; in poorer Countries there are more Wastes, in rich Countries fewer Wastes, therefore is England richer because of its Enclosures; which are more opulent than other Lands, as yielding more Rent naturally and the Conceit that Enclosures impoverish a Country is a mistake so experienc'd. There have been more Acts of Parliament relating to Enclosures of late Years than formerly.

Stimulated by the encouragement of large landlords, by good prices, and by enclosures, agriculture locally improved from 1700 to 1760. In this progress the work of Tull, Townshend, and Bakewell proved of infinite value.

Of Jethro Tull nothing remains to be said. Lord Townshend, who retired from office in 1730, and devoted the rest of

his life to the improvement of his estate in Norfolk, was more immediately successful in his efforts. The improvements which he inaugurated eventually turned both Norfolk and Lincolnshire from rabbit-warrens into corn manufactories and sheep and cattle markets. He reintroduced the practice of marling, advocated enclosures, and demonstrated the value of turnips and clover as the pivots of agricultural progress.

The farmers who followed in his footsteps realised fortunes. Arthur Young, in 1760, thus describes the effect of Townshend's example and of his Norfolk husbandry in a district near Norwich :—"Thirty years ago it was an extensive heath without either tree or shrub, only a sheep-walk to another farm. Such a number of carriages crossed it, that they would sometimes be a mile abreast of each other in pursuit of the best track. Now there is an excellent turnpike road, enclosed on each side with a good quickset hedge, and the whole laid out in enclosures and cultivated in the Norfolk system in superior style. The whole is let at 15*s*. an acre, ten times the original value."

Though Townshend's improvements filtered but slowly into other districts, the first step in advance had been made. Their consequences were widespread, both remote and immediate. Encouraged by his success, other landlords imitated his example. One advantage grew out of another. Without the introduction of winter keep, the career of Bakewell would have been impossible. In the grazier's art still more startling results were attained, and they are indirectly due to Townshend's enterprise, and to the new practices which he made successful.

Hitherto sheep had been valued for their wool, and cattle for their length of leg. Sheep were tall, unthrifty beasts, esteemed for their wool, or valued for points which were absurd because they were useless. Cattle were wall-sided misshapen beasts, "more like ill-made black horses than an ox or a cow." Prize beasts were such animals as "the famous Lincolnshire ox" which was shown in the reign of Queen Anne. In the advertisement it is described "as Nineteen Hands high, and four Yards long from his Face to his Rump. The like Beast for Bigness was never seen in the World before. *Vivat Reginæ.*"

Bakewell of Dishley, near Loughborough in Leicestershire, was the first man who perceived that the day was fast approaching when beef or mutton would be more valuable than wool or power of draught. Born in 1725, he began his experiments in stock-breeding before 1750. He achieved his chief success with sheep. "Small in size and great in value," or "symmetry well covered," were his mottoes. His new Leicesters were superior

to any other breed for their fattening propensities and early maturity. He discovered the principle of selection, and the secret of breeding "in and in," and made it his object to breed animals which weighed most in the best joints and quickest repaid the food they consumed. Though his long-horned Leicester cattle were good milkers, they proved to be little else. But his example and practice were invaluable. His standard was a true one: it was his material, not his system, which failed. The improved South-downs of Ellman of Glynde and Webb of Babraham, or the Durham short-horns of Charles Collings, the Herefords of Tomkins, and the Devons of Lord Leicester and Mr. Quartly, were really his creation.

Third Period—1760 to 1815.

It has been shown that, during the interval from 1600 to 1760, turnips and artificial grasses had been *locally* introduced into field cultivation, that the theory of drainage had been ably discussed, that the art of stock-breeding had been discovered, that the advantages of enclosed over open-field farms had been practically demonstrated, that the work of reclaiming wastes and commons had begun. The diffusion of these improved practices was the useful work of Arthur Young from 1760 to 1815. The knowledge which he expounded and disseminated, Mr. Coke of Holkham and other great landlords illustrated practically. Under the pressure of advancing population, agriculture advanced by leaps and bounds. Cut off from foreign markets by wars or commercial policy, England was compelled to supply from her native resources the needs of vast manufacturing towns. Every available acre of soil was needed. The old open-field system which only provided food for the producer was inevitably doomed. The flail could no more compete with the threshing-machine, or the scythe with the mowing-machine, than the hand-loom could hold its own against the power-loom. Enclosures, reclamation of wastes, partition of commons, large farms, long leases, capitalist farmers, became the cry as soon as the need arose for the manufacture of bread and meat for the million. The change convulsed rural society, but it was made under the pressure of overmastering necessity. The alternative was presented between the collapse of nascent industries or appalling famine.

The first objects to be attained were the recovery of waste lands and the abandonment of the open-field system. Until these results were attained, no general progress was possible. In 1760, millions of acres lay unoccupied, or in common pasture,

or in open-field farms. In each case enclosure took a different form. In the first, it meant reclamation of wastes; in the second, the extinction of common rights; in the third, the consolidation of open-field farms into separate holdings. Three-fifths of the land in England, Wales, and Scotland in 1760 lay in one or other of these conditions. From the northern point of Derbyshire to the extremity of Northumberland a line might be drawn for 150 miles as the crow flies, which passed over nothing but wastes. Rossendale in Lancashire was still a chace. The forest of Knaresborough in 1734 was "so thick with wood that he was thought a cunning fellow who could readily find out" the "Spaws" of Harrogate. From Sleaford to Brigg in Lincolnshire extended a desolate moor, over which the land lighthouse of Dunstan pillar lighted belated travellers.

Thousands of acres of moorlands still lie waste and unimprovable in the North; but similar districts are now rare in the Midland and Southern counties. Yet Needwood Forest, Cannock Chase, Sutton Coldfield, and great tracts of the Staffordshire moorlands were still unreclaimed; Charnwood Forest, Rothly Plain, and Ashby Wolds lay waste in Leicestershire. In Nottinghamshire Sherwood Forest might still have sheltered Robin Hood and Little John. A large part of Berkshire was "no man's land;" Maidenhead Thicket, Bulmarsh Heath, and the downs from Ilsley to Ashbury, knew not the hand of labour, and, even in Miss Mitford's day, a broad belt of two to three miles in width, overgrown with bushes and rough grass, ran from Inkpen to Windsor Forest. In Middlesex, Enfield Chace, Hounslow Heath, Finchley Common, Harrow Weald, Sunbury and Riselip Commons, were all unenclosed. In Essex, the forests of Epping and Hainault spread over a vast tract of country. Kent had many thousands of acres, covered with furze and fern, interspersed with patches of coarse grass. The northern part of Sussex contained 110,000 acres of almost desert tracts. Down to 1791, the Weald of Surrey still bore traces of its utter desolation in the posts which stood across it to guide letter-carriers. White posts, set up by the father of Sir Thomas Lawrence, directed travellers over Salisbury Plain, where, in the days of "Ingoldsby,"

> Not a shrub nor a tree,
> Nor a bush can we see,
> No hedges, no ditches, no gates, no stiles,
> Much less a house or a cottage for miles.

Dorsetshire, from Piddletown, Bere Regis, and Wimborne, to the Purbeck Hills, was a dreary, unenclosed waste. Hampshire not only had its forests, such as the New Forest, Alice

Holt, Woolmer, and Bere, but at Botley and at Waltham there were ten thousand unreclaimed acres. To the wastes and commons must be added the open fields. In 1764 out of 8,500 parishes, 4,500 were unenclosed. A considerable number of these were reduced to separate farms before the close of the century, especially during the years of high prices for corn from 1763 to 1775, when, as a pamphleteer writes (1780), farmers had willingly abandoned their pastures, and even cottagers ploughed up their orchards. Yet in 1794 Oxfordshire still had 100 parishes unenclosed, Bucks 91,000 acres, Bedford 217,000 acres, Essex 48,000 acres, Cumberland 150,000, Huntingdon 130,000 acres; and nine-tenths of Cambridgeshire, one-third of Northants and Rutland, half of Berkshire, and the greater part of Wiltshire, were still cultivated in the open-field system.

In the reign of George III. alone, 6,288,810 acres were enclosed. National necessities demanded the consolidation of small holdings, the extinction of open-field farmers, the enclosure and reclamation of wastes and commons. The step was justified by agricultural and economical arguments; but the social results were deplorable. The change was made at a difficult crisis. At the moment that small yeomen, open-field farmers, and commoners lost the grazing rights on which their existence depended, they also lost their domestic industries. During the French wars the price of necessaries doubled, yet wages remained the same. While agricultural profits were swelled by the stoppage of foreign grain supplies, war prices, and the corn laws, a mischievous poor law enabled farmers to compel rate-payers to pay their labour bills. The disbanding of soldiers, sailors, and militiamen at the close of the war, and the discharge of thousands of artisans from the introduction of machinery, increased the distress of the rural population, and resulted in the social discontent, agrarian outrages, and machine-breaking of the beginning of the present century.

Compelled to choose between the artisan and peasant proprietors, small farmers or copyholders, England determined to sacrifice the latter class. The necessity was deplorable; but, the choice once made, no efforts were spared to meet the crisis, which the rapid growth of population had caused. Improved roads, and increased facilities for the conveyance of heavy goods, opened up new markets to remote agriculturists, and broke down the barriers of custom and prejudice. Traditional prejudices gave way before practical experience. New implements were tried. Small's plough, Meikle's threshing machine, economised labour. Patents were taken out for harrows (Heaton, 1787), sowing-machines (Horn, 1784), drill ploughs (Praed,

1781), reaping machines (Boyce, 1799), mowing machines (Sandilands, 1788), winnowing machines (Cooch, 1800), haymakers (Salmon, 1816), scarifiers, chaff-cutters, turnip-slicers, food-crushers, and other implements. New crops [1] were introduced, such as swedes (1750), field cabbage (1730), kohl-rabi (1750), Timothy grass (1763), prickly comfrey (1790), mangelwurzel (1810). Cattle-shows and ploughing-matches were held throughout the country. Farmers' clubs and provincial societies were established. The old *Society for the Encouragement of Arts, Manufactures, and Commerce*, which had been instituted in 1754, and which expended several thousands of pounds in medals and premiums for the improvement of tillage, grasslands, implements and other agricultural purposes, was supplanted by other bodies. The Bath and West of England Society was founded in 1777, the Highland Society in 1784, the Smithfield Club in 1793. In the latter year the Board of Agriculture was constituted, with Sir John Sinclair as President, and Arthur Young as Secretary. Statistical surveys of the farming of the whole country were made by Young, Marshall, Sir John Sinclair, and twice by the Board of Agriculture. Everywhere great landlords, with "Farmer George" at their head, took the lead in improvements, and endeavoured to diffuse the knowledge and adoption of the best agricultural practices. In Mr. Coke of Holkham, the new system of large farms, long leases, and large capital, found their most active and practical champion. His estate-management, farm-buildings, and cottages, were the model of other landlords; his sheep-shearings were meeting-places for practical and theoretical agriculturists, farmers of every district and breeders of every kind of stock.

The close of the war terminated this period of progress and prosperity. It was succeeded by twenty years of almost unexampled suffering. Land had sold for exorbitant sums; extravagant standards of living, excessive rentals, undue expenditure on buildings, had been the result of inflated prices. Invaluable pasture, which had been ploughed up in years when wheat rose to 115*s.* the quarter, was ruined. Violent fluctuations in the purchasing power of money accentuated the distress, which was aggravated by agrarian discontent. Widespread ruin among both landlords and tenants was the result. It was now that the substantial yeoman disappeared.[2] The table of the House of

[1] These dates are not necessarily the earliest dates of the introduction of these crops; they are the dates of the earliest mention of their growth that I have encountered.

[2] The decline in the number of yeomen contradicted the expectations of Arthur Young and his colleagues. The history of the gradual disappearance of this valuable class would form an interesting subject of inquiry.

Commons groaned under petitions for relief. Select Committees sat to investigate the agricultural crisis in 1820, 1821, 1822, 1833, and 1836. The evidence shows that the loss was enormous. It could scarcely be otherwise, when prices dropped, between January 1819 and July 1822, in the following proportions: wheat (per quarter) from 74*s.* to 43*s.*; beef (per stone) from 4*s.* 6*d.* to 2*s.* 5*d.*; mutton (per stone), from 5*s.* 8*d.* to 2*s.* 2*d.* In 1810, 1824, and 1830–1, the rot swept off vast numbers of sheep; in the latter year it is stated that two million perished.

Agriculture slowly revived. In 1836 the last of a series of committees sat to investigate the crisis. An improvement was manifest, though English farmers on clay farms were still in a bad state. But the evidence showed clearly enough that those who were determined not to continue in the habits of 1790, not to expect any hocus-pocus of the currency, and not to look for some mysterious aid from Parliament, had no cause for despair. It was proved that Scotch farmers, who had adopted a system of high-farming, had weathered the storm. They had expended large sums in liming, draining, and manuring their land; they had adopted the subsoil plough and drainage system of Smith of Deanston; they had economised their labour bills by the use of machinery; they had brought the breeding, fattening, and management of live-stock to comparative perfection. The soil, which had been thoroughly drained, turned up mellow and dry; their crops were heavy, and were profitably consumed; their sheep and cattle, well fed and comfortably lodged, enriched the land and the owner; their economies in labour, manure, and food enabled them to face the fall in prices. The essence of the old system was exhaustion of the soil; the essence of the new was the restoration of its fertility.

Fourth Period—1838 to 1873.

The evidence given before the Commission of 1836 marked a turning-point in English farming. The foundation of the Royal Agricultural Society in 1838 indicates the turn of the tide after the disastrous period from 1815 to 1836, and points the new direction in which progress was for the future to move. It would be impossible to enumerate the discoveries of the new era, in which science was applied to agricultural practice, and in which the best methods of high-farming became slowly, but generally, diffused. Only some of the leading features can be noted.

Vast capital was expended on farm-buildings. Instead of rickety barns and sheds, well-arranged buildings were con-

structed. Quantities of land required drainage, and with the demand came the supply of necessary improvements. Smith of Deanston (1834) and Josiah Parkes (1843) made known their discoveries. Reed's cylindrical pipes (1843), Scrogg's machine for their construction (1845), and the loan facilities provided by Parliament in 1846, enabled prudent landlords to drain their estates. New means of transport and communication brought distant markets to the door. Steam and machinery lessened the cost, and lightened the toil of production. The farmer's resources of crops, manures, winter-food and mechanical labour were indefinitely increased. Mechanics, capitalists, architects, physiologists, botanists, statisticians, were enlisted on the side of the farmer. Unnecessary obstructions to economical tillage were removed; convenient farm roads were provided. The waste of natural manure was prevented, and a great variety of portable artificial fertilisers were discovered. Sprengel and Liebig led the way in the study of agricultural chemistry. From 1835 onwards the use of nitrate of soda and guano gradually spread. British guano, superphosphate of lime (Lawes, 1843), coprolites (Henslow, 1843), ammoniacal manures (Odams, 1851), revolutionised the old rules of cropping. The increased use of manures stimulated not only produce, but drainage; for if the land remained wet, their value was lost. Live-stock was better bred, better fed, and better housed; veterinary science made gigantic strides, and valuable animals were no longer sacrificed to ignorant quacks. Agricultural colleges were founded. New rotations and new varieties of field crops were introduced. Legislative changes, such as the commutation of tithes, the poor laws, the enfranchisement of copyholds, the Enclosure and Drainage Acts, the provision of agricultural statistics, promoted the reviving prosperity. High-farming, good roads, good homesteads, good crops, good stock, good farmers, became the rule and not the exception.

This progress was rudely interrupted by a disastrous period of agricultural depression. One remarkable feature of the financial crisis of 1873–89 is, that it is not local but universal. The South-Sea Bubble ruined thousands, but in England only. The disaster of the Mississippi scheme affected France alone. Now the barriers of European nations are broken down, and the continent suffers or prospers as a whole. But the examination of the causes and effects of the depression hardly fall within the limits of the present paper.

R. E. PROTHERO.

THE VALUE OF PEDIGREE.

At a recent meeting of the Kingscote Agricultural Association, at Kingscote, Gloucestershire, I had the pleasure of addressing the members on the subject of "Pedigree Cattle and Stock—the advantages that have accrued, and the disadvantages which may accrue, from close clinging to pure blood." Subsequently there was a discussion, in which several gentlemen amongst those present took part. At the request of the Journal Committee I have reproduced for the pages of the Journal the substance of my remarks, together with some additions, and I have endeavoured also to embody the opinions of other speakers.

It may be thought from the title of the address that an attack is made on the breeding of "pure" stock; but it is unlikely that one who for thirty years has bred, and continues to breed, "pure" Suffolk horses, "pure" Shorthorn cattle, "pure" Southdown sheep, and "pure" Berkshire pigs, should wish to do this. My object, on the contrary, is to show what advantages have accrued from "pure" breeding, not only to the breeder, but to the consumer and community at large. At the same time, it will be my endeavour to point out disadvantages which may have accrued from this too close clinging to "pure" blood, and to indicate its effect both as regards the production of meat and as affecting the quantity and quality of milk. I propose to confine myself almost entirely to the Shorthorn, or what at one time was called the "Durham," breed of cattle; not only because it is best known to myself, but because it is the oldest "pedigree" breed of cattle in existence, and therefore the best adapted to the purpose in view.

With reference to pedigree and its value, I would say that all life has pedigree. When a register or record of parents has been kept, on both father's and mother's side, it constitutes a pedigree; but, as a matter of fact, few have been kept, either in the human or the brute races, still less in the vegetable world. The earliest records are Biblical, and are chiefly of fathers and sons. Only brief accounts of *dams* descended to the Arabs with their horses. At the end of the eighteenth century English breeders began to pay increased attention to the ancestry of their horses and cattle, and particularly of their sheep, so much so that just about a hundred years ago rams of the Leicester breed sold for several hundred guineas each. Bakewell made 1,200 guineas for three rams in 1789, and one ram was actually let for 1,000 guineas. These

prices are not unlike those recently paid in Australia for Merino sheep. We read of 1,000 guineas for the bull *Comet*, sold by Charles Colling in 1810. History repeats itself, and at the sale of the Queen's Shorthorns at Windsor on March 3 of the present year, 1,000 guineas was given by the President of the Royal Agricultural Society for the bull *New Year's Gift.*

It is hardly necessary to refer to horses and their pedigrees, performances, and value. It is fresh in everybody's memory that *Doncaster*, just dead at eighteen years old, was sold for 14,000 guineas, whilst *Blair Athol* was sold by auction for 12,500 guineas, and *Ormonde*, grandson of *Doncaster*, went abroad at 15,000 guineas. So much is the blood of *Ormonde* esteemed, that it has lately been proposed to form a company with a capital of 30,000*l.* to bring him back again, though I hope the effort will not succeed.

An interesting side-light is thrown upon the subject of prices in the past by a quaint catalogue of a century ago. It bears the title, "Particulars of the Breeding Stock, late the Property of Mr. Robert Fowler, of Little Rollright, in the County of Oxford, deceased, comprising the Names of the several Purchasers, their Places of Residence, and the Price of each respective Lot, which was sold on the Premises, the 29th, 30th, and 31st days of March, 1791, by R. Parry, of Shipston-upon-Stower, Auctioneer." At the foot of the title-page appears the caution: "N.B.—To prevent Impositions on the Public, none will be genuine but those signed with the Hand Writing of *Rd. Parry*," and the auctioneer's signature is well preserved in the ink of the eighteenth century. The subjoined extracts from the preface, which is dated May 14, 1791, seem to me to be worth reproducing here:—

From the following account and extraordinary prices I am persuaded the acknowledged superiority of Mr. Fowler's Stock will fully appear. I question if tradition or history can furnish such another account in Europe.

The single circumstance of so many people, desirous of improving their breed of Cattle, assembling themselves together on the occasion (from almost every county in England) is sufficient ground to evince what reputation this stock has obtained with the public; while the great prices that were offered at the Hammer, and the much greater offered for many of them afterwards, is abundantly sufficient to *prove* their high estimation of it.

I will readily admit it frequently is the case at Sales by Auction, that people are excited by opposition, or encouraged by the coincident opinions of others to exceed their intentions. This may be termed a capricious bravery or implicit confidential boldness resulting from the judgment or conduct of their competitors: but where as at this sale, most of the Cows, and many of the Bulls, might have been resold upon the spot at considerably higher prices, and I believe none repurchased at their first cost, no such imputation of misconduct can apply. Two Heifers, of only two years old, being sold the first day out of their turns, were at the request of the com-

pany, and by consent of the purchasers, put up again on the second in their proper places and resold, at more than Forty Guineas advance. I doubt not the truth of my information that also *Garrick*, *Sultan*, and *Young Sultan*, to mention no more, might have been resold by private contract at the advanced price of Two Hundred and Fifty Guineas.

It has been matter of candid speculative enquiry by some, whether upon the principle of advantage it can answer the purpose of those who were purchasers of Cow stock at so great prices? and the question has illiberally, and as positively been answered in the negative by others. It is more than probable the same sentence would have been pronounced by such arbitrary judges upon the conduct of Mr. FOWLER on his first setting out. He began with two Cows, purchased at what was then thought to be a great price, from Mr. WEBSTER's stock, of *Canly*, in the county of *Warwick*; to these he hired a Bull called *Twopenny*, of Mr. BAKEWELL. Hence may be dated the beginning of his improvement. And why another man with a small number of the same kind of stock *greatly improved* to begin with, may not make an advantage in a considerable proportion to Mr. FOWLER, who had also but a small number to begin with, will I think need some reason to explain.

In the above-mentioned Cows and Bull, Mr. FOWLER was very fortunate: from them he had the two Cows called *Old Long Horn Beauty* and *Old Nell*. He had several Bulls of Mr. BAKEWELL afterwards, but since the Bull called *D*, Sire of *Shakespeare*, which he had of him about the year 1778, he kept entirely to his own stock.

. . . .

Mr. FOWLER was somewhat peculiar in his conduct respecting the improvement of his stock; which I conceive to have been one reason, amongst others, of his having succeeded so well. He made it a rule long ago, not to part with a superior Cow while he entertained a hope of her being useful to him as a breeder. The great prices which he has been offered for some of them (particularly the sum of One Thousand Guineas for three Cows and a Bull) nor the advice of his friends to accept such offers, were sufficient to induce him to deviate from a plan which he had long adhered to with advantage. Perhaps one reason for his adopting this plan might have been, his having sold to Mr. GUY of *Taddington*, three of *Twopenny's* Heifers, for which he was said to have repented ever after: these he sold about the year 1771 at Eighty Guineas, and afterwards offered to re-possess himself with one of them called *The Painted Lady*, at the price he had taken for the three.

With these Mr. GUY set out as a breeder of this kind of stock, and although unfortunate in the choice of some Bulls which he afterwards made use of, and therefore not so successful as he otherwise might have been, yet, the prices of his stock which was sold by Auction in April 1790 are sufficient to convince us of *their* esteemed superiority to most others; some of his Cows (by a Bull of Mr. FOWLER's) sold from Thirty to upwards of Forty Guineas apiece; this I mention here as another instance of advantage (although much inferior to Mr. FOWLER's) derived from breeding this kind of stock from a small beginning.

. . . .

I do not mean to attribute all the advantage which Mr. FOWLER has received from breeding to his Cow stock, altho' they were esteemed much superior to his stock of Sheep. The merit of his Sheep appears to have been derived also, directly or indirectly, from the stock of Mr. BAKEWELL, by whom their excellence being more fully exemplified, I shall say but little concerning them. He had for several years been endeavouring to improve this part of his stock by the use of Leicestershire Rams, and of his success

therein the prices he has lately taken for the hire of some parts of it, and the prices which those brought (although not in condition for sale) at the Auction give a very good account.

. . . .

That Mr. Fowler both planned and performed well, which I think it requires no better testimony to prove, it will require a wilful stubbornness to deny. If any suppose a better design may be pursued, let them give us proof proportionable to their possession, I heartily wish them success. Till then let Mr. Fowler's conduct remain an example for imitation to posterity for ever.

Some of the highest-priced lots are quoted below as they appear in the catalogue, and it must be remembered that a pound sterling was much more valuable a hundred years ago than it is to-day.

Lot	Description	Purchasers and residence	Sold for
		BULLS.	£ s. d.
1	Garrick: Five years old, by Shakespeare, of Broken Horn Beauty, which came of Long Horn Beauty	Mr. Stone of Quarndon, Leicestershire; said to be for the use of himself and several others jointly	215 5 0
2	Sultan: Two years old, by Garrick, of Garrick's mother alias Broken Horn Beauty	Mr. Freeman, Hitcott, and Mr. Eden, Norton, Gloucestershire	220 10 0
3	Washington: Two years old, by Shakespeare, of the bow horn red cow, alias Washington's mother	Mr. Michael Buckley, Normanton, Nottinghamshire	215 5 0
4	Young Twopenny: Two years old, by Garrick, of Long Horn Beauty	The joint property of Messrs. Cox, Harrison and Macey, Leicestershire	68 5 0
24	A bull called A. One year old, by Garrick, of Brindl'd Finch, daughter of the great brindl'd cow	Lord Harborough, Leicestershire	157 10 0
25	A bull called B. One year old, by Garrick, of the Blue Heifer, daughter of the great brindl'd cow	Mr. William Seaton, Scassby, near Doncaster, Yorkshire	85 1 0
26	Young Sultan: One year old, by Garrick, of Nell	Messrs. Cox, Harrison and Macey, Leicestershire	210 0 0
27	A bull called D. One year old, by Garrick, of a daughter of Short Tails	Mr. Thomas Clarke, Lockington, Leicestershire	88 1 0
28	A bull called E. One year old, by Garrick, of Nancy	Mr. John Zouch, Millcote, Warwickshire	152 5 0
29	A bull called F. One year old, by Garrick, of the bow horn'd red cow, alias Washington's mother	Mr. Francis Robbins, Lillington, Warwickshire	105 0 0

Lot	Description	Purchasers and residence	Sold for
		COWS.	£ s. d.
12	Nell's White Back: Three years old, by Garrick, of Old Nell	Lord Harborough, Leicestershire	89 5 0
30	Brindl'd Beauty. By Shakespeare, of the Long Horn Beauty, supposed in-calf by Garrick	Mr. Russell, Cubington, Warwickshire, for Messrs. Knowles and Co.	273 0 0
31	Garrick's Sister: By Shakespeare, of Garrick's mother, alias Broken Horn Beauty, supposed in-calf by Garrick	Ditto Ditto	120 15 0
32	Washington's Mother: By a son of Old D. brother to Shakespeare, of Nell, supposed in-calf by Garrick	Mr. Astley, Oldstone Hall, Leicestershire	194 5 0
33	Long-Horn'd Nancy: By Shakespeare, of a daughter of Old Nell, in-calf by Garrick	Mr. William Freeman, Hitcott, Gloucestershire	110 5 0
34	Spotted Nancy: By Shakespeare, of the above daughter of Old Nell, supposed in-calf by Garrick	Mr. Millington, Bubton, Wilts (purchased for Mr. Fowler)	84 0 0
35	Black Heifer: Three years old, by Shakespeare, of the brindl'd Beauty	Mr. Russell, Cubington, Warwickshire, for Messrs. Knowles and Co.	141 15 0
37	Young Nell: By a brother of Shakespeare, of Old Nell, has been bull'd by Garrick	Mr. James Moore, Charlcote, Warwickshire	126 0 0
40	Red Cow: By Shakespeare of old Skew Horns, alias Pillion Rump, in-calf by Garrick	Mr. Cox, Brailsford, Derbyshire	76 13 0
41	Nell's Daughter: By Shakespeare	Mr. Russell, Cubington, Warwickshire, for Messrs. Knowles and Co.	136 10 0
44	Douk Horn: By Shakespeare, of Old Short Tail, with a cow calf by Garrick	Mr. Edward Higgins, Old Stratford, Warwickshire	81 18 0
45	Blue Heifer: Four years old, by Shakespeare, of the great brindl'd cow, with a bull calf by Garrick	Mr. Samuel Huckfield, Choice Hill, Oxon	110 5 0
48	White Back'd Cow: By Shakespeare's brother, of a daughter of the short tail cow	Mr. Eden, Norton, Gloucestershire	81 18 0
51	Broken Horn: Two years old, by Garrick, of the great brindl'd cow	Mr. William Seaton, Seasby, near Doncaster, Yorkshire	69 6 0

Lot	Description	Purchasers and residence	Sold for £	s.	d.
	SHEEP STOCK				
54	Ram No. 1	Mr. William Smith, Norton, Gloucestershire	44	2	0
55	Ditto No. 2	Mr. Kimmer, North Cerney, Gloucestershire	45	3	0
56	Ditto No. 3	Mr. John Davis, Rollright, Oxon	31	10	0
57	Ditto No. 4	Mr. Smith, Ford, Gloucestershire	35	14	0
69	Six Ewes, spot on the head	Mr. Samuel Huckfield, Choice Hill, Gloucestershire	53	10	0
71	Ditto ditto on near side	Mr. Smith Ford, Hitcott, Gloucestershire	60	0	0
74	Ditto ditto on further hip	Mr. Gill, Cleve Peppard, Wiltshire	63	0	0
96	Six theaves, spot on the head	Mr. Robinson, Wellingborough, Northamptonshire	56	14	0
151	Six ewe tegs, spot on the head	Messrs. King and Creek, Blenheim Park, Oxon	36	0	0
158	A Ramhog, No. 71	Messrs. King and Creek, Blenheim Park, Oxon	53	11	0
168	Ditto No. 81	G. Perrott, esq. Fladbury, Worcestershire	36	15	0

The foregoing details serve to show not only the high prices, and the arrangement of the catalogue, in those old days, but they are of interest as indicating the cumbrous methods whereby lineage or pedigree was expressed. Before leaving this relic of the past, I may observe that the purchasers came, even at that period of slow travelling, from as many as ten counties, viz., Gloucestershire, Leicestershire, Lincolnshire, Northamptonshire, Nottinghamshire, Oxfordshire, Shropshire, Warwickshire, Wiltshire, and Yorkshire.

Returning to the subject of pedigree cattle, the question may pertinently be asked, "What is a thoroughbred or pure-blooded Shorthorn?" The simplest and most obvious answer is that it is an animal which traces its descent through a line of ancestors on both sides of its parentage, back to the earliest ages in Shorthorn history, or to the fountain head of its race. Shorthorns had been more or less cultivated, and no doubt greatly improved, through several centuries previous to the year 1730, in the counties comprising the ancient Northumbria, and we have some few records of animals by name from 1730 down to the year 1780. Then it was that, through the intelligence and enterprise of some of the younger breeders, Shorthorns began in considerable numbers to take position by partial

pedigree, as well as by name, in a few individual herds. The records of many animals were kept, in some instances, in the private notes of their breeders; in a much larger number of cases they were retained merely in the memories of their breeders. Such, then, were the only records, and they were not reduced to a permanent shape until the year 1822, when the first volume of the *English Herd Book* was published.

It appears, therefore, that the pedigrees of the Shorthorns remained either in private memoranda, or were preserved by tradition, for more than half a century after some of these cattle had acquired not only individual names, but reputations as prominent and leading animals of their race. Their progress and increase in numbers during those years had been so rapid, and the chances of error in perpetuating their lineage were so many, that an imperative necessity compelled their breeders to establish for them a permanent record.

The *Shorthorn Herd Book* was originated as a project some years before its publication. At a meeting of prominent breeders, held at one of the agricultural gatherings in Wynyard Park, Durham, in 1812, the publication of a record for Shorthorns, like the stud book for horses, was suggested. The idea was at once adopted, and to Mr. Coates was entrusted the editorship of the book, this being a position for which he was peculiarly fitted owing to his extensive knowledge of pedigrees and of breeders, as well as to the great interest which he took in cattle. Mr. Coates at once commenced to collect material for the work—no light task in days when the only means of conveyance was by coach or on horseback, the latter being Mr. Coates's mode of travelling when he was engaged in collecting the pedigrees for the first volume. Financial difficulties delayed the publication of the work. In 1818, after the sale of Robert Colling's cattle, the project was revived, and, as a means of raising the necessary funds, a subscription was proposed. In the meantime the collection of pedigrees proceeded, but the first volume of the *Herd Book* was not issued until the autumn of 1822. It had a list of subscribers numbering 455, and contained the pedigrees of 710 bulls and 971 cows. Mr. Coates received little or no remuneration for his labours in connection with the first volume, after the payment of the necessary expenses, but he had the satisfaction of having gained his point, for now Shorthorns were not only an established and popular breed, but they had a record of which he was justly proud, and which was greatly owing to his own exertions.

The second volume of the *Herd Book* appeared in 1829, seven years after the issue of Volume I., and recorded 890 bulls

and 1,289 cows. Volume III., containing the pedigrees of 1,297 bulls and 1,662 cows, appeared seven years later (1836), and was issued by a son of Mr. Coates, the latter having died before its publication. Volume IV. appeared in 1843, and contained the pedigrees of bulls only to the number of 3,802. The following year Volume V. was issued in two parts, containing the pedigrees of cows only. The *Herd Book* then became the property of Mr. Henry Strafford, who issued in 1846 the sixth volume, and continued its publication every two years down to 1873, in which year Volume XX. appeared. In 1874, Mr. Strafford found the publication of such a work too onerous and exacting at his time of life, whilst the responsibility had also become great, owing to the largely increased value at that time of pure-bred Shorthorns. Fraud, I am sorry to say, also was creeping in—indeed, had crept in—both as regards pedigree and in attempted fraudulent exchange and misrepresentation of cattle. The matter was thereupon taken in hand by several well-known Shorthorn breeders, who ultimately established, in July 1874, the Shorthorn Society for the United Kingdom of Great Britain and Ireland. The Society purchased the copyright and stock of herd-books from Mr. Strafford for 5,000*l.* and continued the publication yearly, the most recent volume issued being (in 1891) Volume XXXVII., containing the pedigrees of 1,835 bulls (thus bringing the registered number up to 62,062), and of 3,920 cows with produce.

The successful formation of the Shorthorn Society has led to the establishment of many other cattle societies, besides horse, sheep, and pig societies on a similar basis. Amongst them may be mentioned, for cattle :—

Hereford Herd-Book Society
Devon Cattle Breeders' Society
South Devon Herd-Book Society
Sussex Herd-Book Society
North Wales Black Cattle Society
Welsh Black Cattle Herd-Book
Red Polled Society
Polled Cattle Society (Aberdeen Angus)
Galloway Cattle Society
Highland Cattle Society of Scotland
Ayrshire Cattle Herd-Book Society
English Jersey Cattle Society
Jersey Herd Book
English Guernsey Cattle Society
Guernsey Herd Books (2)
Royal Dublin Society's Kerry and Dexter Herd-Book

Our various horse societies and stud-books include :—

General Stud-Book (Thoroughbreds)
Hunters' Improvement Society
Hackney Horse Society
New Forest Pony Association
Shetland Pony Stud-Book
Cleveland Bay Horse Society
Yorkshire Coach Horse Society
Shire Horse Society
Clydesdale Horse Society
Suffolk Horse Society

The sheep societies comprise the following :—

Cotswold Sheep Society
Lincoln Longwool Sheep-Breeders' Association
Oxford Down Sheep-Breeders' Association
Southdown Sheep-Breeders' Association
Shropshire Sheep-Breeders' Association and Flock Book Society
Hampshire Down Sheep-Breeders' Association
Suffolk Sheep Society
Cheviot Sheep Society
Dorset Horn Sheep-Breeders' Association
Wensleydale Longwool Sheep-Breeders' Association and Flock Book Society
Pure Select Wensleydale Sheep Breeders' Association and Flock Book Society

There are likewise pig herd-books, such as those of the British Berkshire Society and the National Pig Breeders' Association, but how these are kept reliable I am at a loss to know, for it seems to me a very difficult and dangerous proceeding to have to deal correctly with a litter, or, as often must be the case, with litters of pigs. The same observation applies to sheep, for how is it possible to keep the registration even of a flock of 200 ewes? At the Shows of the Royal Agricultural Society, and at all our principal breeding shows, cattle and horses must be certified to be entered, or as eligible for entry, in the herd- or stud-book of their respective breeds, whilst the first stipulation made by a foreign buyer is that the animal shall be entered in its herd- or stud-book, or that a certificate be obtained from the breed society vouching for the accuracy or eligibility of its pedigree. The value of the registration of pure stock thus becomes apparent, and it should not be neglected by any breeder, however small, as the want of attention to this matter may mean, in the case of an exceptionally good animal, a very serious loss when it comes to be sold.

With reference to the value and influence of pure-bred stock, it is of interest, as showing the rise and fall in the price of pure-bred Shorthorns, to glance at a return lately published in the Journal (Vol. II., third series, 1892, p. 878) of the sales in the late Duke of Devonshire's Holker herd, from the years 1851 to 1889 :—

Year	Head sold	Average			Total of sale		
		£	s.	d.	£	s.	d.
1851	56	25	2	6	1,407	0	0
1864	30	66	3	0	1,984	10	0
1871	43	240	13	10	10,349	17	0
1874	43	383	13	3	16,497	12	0
1878	30	664	1	10	19,922	14	0
1883	45	167	3	0	7,524	6	0
1889	38	104	13	0	3,981	12	0

These, it may be noted, are by no means the highest prices that have been given for pedigree Shorthorns. It will be remembered that a much higher price (4,500 guineas) was given by Lord Fitzhardinge for the bull *Duke of Connaught*, and large as was that sum, I believe he paid his Lordship back the amount given and a very high interest besides. It is reported, indeed, that he made or earned 7,000 guineas, and improved the Berkeley herd into the bargain. Again, some of our breeders went over to America and gave much higher prices than those realised at the highest Holker sale and brought the cattle back to England, though I fear they were not remunerated for their plucky enterprise.

All must agree that since purity of blood was first taken up by breeders of Shorthorns,—and with purity of blood, at all events at first, symmetry of form, quality (that is good handling), robustness of constitution, and other essential points were combined—the common stock of the country has very greatly improved. Within my own recollection it is difficult to call to mind a greater contrast than that afforded by the cattle now seen in Gloucestershire, both on the Hills and in the Vale, whether steers for fattening or heifers and cows for the dairy, as compared with those of forty years ago. And does not this change, this extraordinary change, owe its origin and its progress to the pure-bred bulls brought in the first instance to Tortworth by the late Lord Ducie, and since then to other landlords and to some tenant farmers who would not be denied, but formed herds of pure-bred Shorthorns for themselves, from which herds bulls filtered, as it were, into every tenant farmer's herd in the county?

As in Gloucestershire—and, by the way, this breeding of pure cattle had been going on in the northern counties of Cumberland, Durham, Northumberland, Westmoreland, and Yorkshire, for some time prior to the epoch I am speaking of, with good results equally impressive—so, all over the country, the same indisputable good effect has been brought about, not only with Shorthorns, but with every other breed of cattle. Nothing can be more striking than the differences seen in the cattle which now come from Ireland as compared with those which came but a few years ago; and with help from the State as to pedigree bulls, which the fortunate Irish farmers are receiving, a still greater improvement will show itself.

I need refer but briefly to the excessive value which some few years ago Shorthorns attained, this enhancement being much stimulated by the determination of our brethren across the Atlantic, both in the United States and in Canada, as well as

of our friends in the Colonies, to obtain our very best blood. Acceptable as, at the time, was this rise in values—I participated in it myself, selling a yearling heifer for 2,000 guineas (I say nothing of having afterwards to sell that heifer's family on account of unhealthiness, and the pang it cost me)—I yet venture to think it did more harm than good, as people purchased for blood, and blood alone, and that blood more on paper than in the good-shaped robust animal.

Let us next consider milking properties. It has often been stated that pure-bred Shorthorns are deficient in milking qualities, and that there is some ground for this contention I admit, though I cannot allow that this failure of milking properties was inherent in the breed, having been brought about more by the condition the animals themselves were kept in. Heifers were made too fat, this state continuing, perhaps, for several generations. That pure-bred stock are invariably deficient in milking properties cannot be the case, for do we not see in the numerous dairy herds some of the best and most prolific milkers, not only got by pure-bred bulls themselves, but even by several successive crosses of pure bulls? That indifferent milkers will be found in pure-bred herds, as well as in herds not so well bred, is sure to be the case—the sooner they are weeded out the better,—but careful attention to good milking strains and families, and breeding from such on both sides, will make the number of the defective animals exceedingly small. At how many of our Shows—the Dairy Show held in the month of October at the Agricultural Hall, Islington, for instance—do we see prizes given for the best milking Shorthorn "not eligible for entry in the Herd Book," and again for the best milker that is eligible? Although the former may show larger udders and may give perhaps rather more milk, yet the latter will be very little inferior to them. Furthermore, if we came to examine into the breeding of the former we should probably find that there were many crosses of the blood of pure-bred bulls in its veins, not only on the sire's, but on the dam's side as well. It is simply a case in which much care has been taken for the last several generations to breed on both sides from milking families, and the eligibility for the Herd Book, although perhaps there, has been ignored.

Upon this subject of milking properties, Lord Suffolk said, in the course of the discussion, that his experience led him to the conclusion that by too close in-breeding much of the milk-yielding capacity was sacrificed. Alluding to a well-known herd, he said he did not believe that the highly-bred Duchesses which it contained would give a pailful of milk in a week, and it was

well known that the owner of the herd got wet-nurses for all his calves, who probably never saw their mothers again after they were born. Such a result as that could only be attributed to in-breeding—at least, he could assign no other cause.

In a letter upon this subject which I have received from Mr. G. Drewry, the experienced agent of the Holker estates, that gentleman writes:—

> There is no doubt that many Shorthorn herds have very much deteriorated in their milking properties. I think this is more owing to high feeding than to line breeding, but both high feeding and line breeding have been carried too far. It is the fashion now for many people to run down pedigree Shorthorns, and praise what they call dairy Shorthorns; but when would the grand dairy cows we see at our shows have existed had it not been for pedigree herds? The rage for line breeding was very much the fault of the Americans, who would not look at an animal unless it was bred in that way.

As to the fattening of pure-bred cattle, no one can deny that they fatten quicker, and come to maturity sooner, than mongrel-bred ones. Think for one moment of the difference between a cross-bred coarse big-boned steer and a pure-bred fine-boned one. It will take as much food again, and as much time again, to fit the former for the butcher as the latter. Even let the former possess equal weight and fatness, which animal will the butcher take and give most money for? There can be no doubt it will be the pure-bred one. Again, will the badly, coarse-bred cow or steer come to maturity as soon as the pure- or well-bred one? Would it be possible to bring into the market the admirable steers which we see now at two years old, or at least under three years, if it had not been for the large admixture of pure blood? There can be but one answer to such queries, and that is that we have proof positive of the very great advantage of pure blood both in the fatting of animals and in bringing them early to market, giving the consumer at the same time fine-grained meat of a quality which a few years ago he could not obtain.

It will not be thought, from what I have said, that the amalgamation of the blood of two breeds will not produce as good beef at as early maturity as that of one. As a matter of fact, the first cross is pre-eminently advantageous in this respect, and the cross between, for example, a Shorthorn and an Aberdeen Angus, or a Shorthorn and a Hereford, will give at once a grand animal and the best of beef. Again, as to milking properties, a cross between a Shorthorn and a Jersey will produce a pre-eminently good milker. These crosses will be far better when each animal is pure, instead of half-bred on each or either side.

I may observe that Lord Suffolk agreed with me as to the fattening propensities of pure-bred stock—the fine-boned, good-quality animals feed quicker, more evenly, and make better beef than animals not so well bred. As to first crosses, his Lordship regards them as constituting a very good resort for people who do not keep pedigree herds, but he has not himself had very remarkable results in the direction of milking properties from crosses between Shorthorns and Channel Islands cattle.

Mr. James Peter stated, on the other hand, that with regard to feeding properties, his experience is that no animal will feed so well as a cross-bred—a well-bred animal crossed with one under-bred, in order to produce more flesh and less fat.

These effects have been brought about at considerable outlay, but to-day the pure-bred animal is obtainable by everyone at little if any higher cost than common stock. The necessity of the adoption of fresh blood is obvious, and the question has been asked, Where is fresh blood (in Shorthorns) to be obtained? The Bates blood has long been known for the size and quality, the hair and colour, and the good milking properties of its animals; the Booth blood for form and substance, and quiet feeding. Latterly the Scotch blood has come to the front. Breeders in Aberdeenshire, and the adjoining counties, many years ago took up good Shorthorns both of Booth and Bates blood, and both females and males. In some cases, after years of long and careful breeding, they have succeeded in establishing pedigrees of their own, as Mr. Stiles Rich and his father before him did in Gloucestershire, and Mr. Stratton and his family in Wiltshire. Whether, however, it is due to blood, or to soil and climate and management, the Scotch Shorthorns have displayed noteworthy feeding properties and hard constitution; at the shows they have been exhibited with great success. The Aberdeen Polls are well known to be a very hardy, heavy-fleshed race, and some of the Scotch Shorthorns seem to acquire the lean flesh-forming qualities of the local breed.

A word as to the "Marts" which are so extensively patronised nowadays for the purchase of bulls—Birmingham, Bristol, Lincoln, Penrith, or any other. I have used the first two myself for the sale of bulls, yet I cannot but consider them as somewhat dangerous places for breeders or dairymen to resort to for the purchase of their sires. There is no opportunity of seeing the herd or family from which the animals come, or of judging the qualities of their sires and dams, or of ascertaining whether those qualities are more conducive to fattening or to milking properties. There is lacking the opportunity to dis-

cover if "Like begets like," and to prove that the ancestors of a pure-bred animal in reality constitute "pedigree."

With reference to the points now under notice, Mr. J. Bennett said he believed the time would soon come when we should all have to do away with the paper pedigrees, and have rent-paying animals that will carry their pedigrees on their backs. He is always pleased when he can take his cross-bred cattle into a showyard against the pure-bred cattle and beat them, as he almost always does, for dairy qualities. Shorthorn breeders, he considers, will have to be more particular as to the cows they breed their bulls from, for it is no use to breed bulls from cows with no milk. He has had pure-bred Shorthorns, but they were of no value as milkers, only as grazers. Farmers want dairy qualities, and they should see the dams of the bulls, and assure themselves that they possess dairy qualities, before purchasing. As to keeping Booth and Bates blood distinct, some of the most successful breeders have been those who have crossed different strains of blood. The late Mr. Stratton and his sons, who have been so successful in the showyard, never kept to either Booth or Bates, and a mixture of blood gives strength of constitution.

It would appear, from Mr. Bennett's remarks, that pure-bred Shorthorns are no longer reqnired. No doubt we could get on very well for the present, but after a little time we should begin to take to selection again—I mean selection of blood. We should begin to be particular, and would be very glad to get pure-bred animals again. As it is, we have a start which our forefathers had not; they began from comparatively poor stock, and worked them up to the pitch of twenty years ago. The boom in Shorthorns, as in many other things, was carried beyond all bounds of what was good for the country, and I have endeavoured to show how by more careful selection we can still get the animal we need. We must take a little more pains to get it, but at the same time it will cost very much less than formerly.

I do not propose to enter into this question as regards sheep and pigs, for nearly, if not all, that has been said as regards cattle applies to them as well. I may, however, make this remark—and for the second time, so as to emphasise it,—that the difficulties of keeping really accurately the flock- or herd-book of either sheep or pigs seem to me almost, if not entirely, insuperable. The breeder must depend implicitly and entirely on his shepherd or his pig man, and even with the help of ear or other marks it seems to me to be impossible for, say, a shepherd with a flock of 300 ewes lambing, or a pig-man with four or five sows farrowing, to keep a correct record.

Suppose, moreover, anything suddenly happens to either man, there must arise such confusion as to the lambs or young pigs that they could not be entered correctly. Take the Goodwood flock of (for the last sixty or seventy years) pure bred Southdowns, some 1,000 in number. It would take more than a clerk could do, going from shepherd to shepherd, to keep any list, and even then it might not be correct. That a list of rams and boars used, with the names of the breeders, should and could be kept, I admit, and would certainly advocate, but further than that I am not prepared to go, knowing well the impossibility of guaranteeing complete accuracy by any flock-master or pig-breeder.

Let us now inquire into the disadvantages that may accrue from close clinging to pure blood. This, I feel, is the more difficult part of my task, and, being neither a scientist nor a veterinarian, I cannot enter upon it with any authority, but can only give my own opinion. This may be taken for what it is worth, and, in any case, is likely to be warmly criticised. We know that with wild animals of all sorts, in all parts of the world, as well as with herds of deer, and in two instances with cattle even in this country, the survival of the fittest asserts itself. Hence, in-and-in breeding in no way deteriorates animals either in form or any other properties, not even in milk. We have an example of this in the case of the wild white cattle of Chillingham, and I know a herd of fallow deer in quite a small park in Lancashire where I am assured no change of blood has been infused for several generations; yet the deer are not only some of the finest I have ever seen, but keep their peculiar character and colour, the latter menel, in a marked degree.

The case is altogether different with domesticated animals, of which man chooses those he thinks are the fittest for his purpose, and then keeps them in a domesticated or semi-domesticated state. It is to our interest, therefore, that in selecting the fittest they should be well chosen, and that care be taken to pick the strong, robust, best-shaped animal from the strongest, largest, most robust, and best-shaped parents. I am afraid that this precaution was not always thought of, and for a time, at all events, there was but little discrimination used as to mating cows and bulls, so long as they were of the best pure blood attainable. This did not apply to those who first took up the breeding of pure-bred Shorthorns—they acted with much discrimination—but soon, in the race to obtain pure blood, and afterwards, when the value of it increased so enormously, careful consideration was cast to the winds. Then came

the time when blood alone was thought of, and even the mixing of different strains or families was regarded almost as a crime.

The resultant in-and-in breeding without discrimination led quickly, it may be feared, to the deterioration of the animal, and to what is almost worse, constitutional and hereditary disease, the effects of which have been sorely felt. Tuberculosis in its several forms, tumours, scrofula, &c., have invaded very many herds, both of pure and not pure-bred cattle, and these diseases certainly have increased in the last few years. This may be in some measure, and perhaps to a very large extent, attributed to in-and-in breeding. Such breeding certainly tends greatly in the direction of sterility, as is evidenced by several of the highest bred strains of blood having almost died out, but when crossed again with alien or nearly alien, but still pure blood, have been resuscitated.

Abortion has often been attributed to in-and-in breeding, and some say that pure-bred animals are the more liable to it. Of this I am not at all certain, for abortion is one of those phenomena not yet understood or explained. Our highest veterinary science is still at fault when asked to account, or find out a remedy, for it, and its attacks are as fierce and frequent in half-bred as in pure-bred herds. There may be other diseases which in-and-in breeding will develop more rapidly than in cross-bred herds, and "wasters" may be seen in larger numbers in the pure-bred than amongst the cross-bred animals, although there are enormous numbers of wasters in poor dairy herds, badly kept and half-starving. All the trouble emanates from much the same source in both—the want of robustness, which, as I have shown, can be rapidly induced by in-and-in breeding.

To the section of the subject we are now considering, Mr. Peter contributed some interesting remarks in the course of the discussion. He questioned whether pedigree-breeding and stud- and herd-books have done our cattle very much good, and he doubts whether they have the same robustness of constitution as they had years ago. He is afraid that a lot of our pedigree animals, from the way they are bred, have almost done more harm than good. He thinks Shorthorn breeders should not breed from the herd-book, but from selection, getting the best and most robust cattle and breeding them together, as Bates did. Of course, at the time of the boom we could not afford to go in for a cross, because the Americans came over, some of them not knowing a Shorthorn from a Gloucester, and bought animals simply because their pedigrees looked well on paper. English breeders received their thousands for these long pedigrees, and

they could not be blamed for doing so, but they are paying the penalty for it now. Referring to the sale of Mr. Campbell's Shorthorns at New York Mills, in September, 1873, when eleven females of the *Duchess* tribe averaged 4,522*l.*, and six females of the *Oxford* tribe 1,087*l.*, Mr. Peter asked, What have these animals produced? Now, when prices have got to a nice level, is, he thinks, the time for Shorthorn breeders to begin to breed from selection, and to breed strong, healthy, robust animals that will pay for the food they eat, and not need to be pampered and almost kept in lavender till they get a certain age.

It must not be forgotten that want of robustness may be aggravated, if not actually created, by the manner in which a calf is brought up and kept during, at all events, the earlier portion of its life. My belief is that the more naturally a calf is brought up the better; the diet nature prescribes for it is the best, that is milk, followed by good sound herbage, whether as grass or hay. Plenty of air, with room and light, and, above all, not being kept on a hotbed of dung, or exposed to cutting blasts or on wet ground, are most desirable. In fact, without being pampered, to be kept clear of chills, and, without being stinted, to have wholesome, good food, not too stimulating, and not in excess, are the dictates of sound practice. Again, the milking properties, I believe, may become greatly lessened by the way a heifer is brought up and fed. If kept too fat she will yield but little milk, so that in the rearing of all breeding cattle the happy medium should be striven for—a condition that will keep the "calf's flesh," admit of no check in growth or healthy vigour, and yet in no way make them fat. As with young cattle, so with lambs and young pigs; they must be kept well, and special care should be taken that they receive no check, but are continued in that growing condition so desirable for all young animals to maintain.

In the preceding pages my endeavour has been to indicate, firstly, the advantages, and secondly the disadvantages, of clinging to pure blood. I have also endeavoured briefly to trace the history of the pure-bred Shorthorn, and to show the good that has arisen, and the bad effects that may have arisen, more owing to want of care and attention than anything else, from the use of "pure blood." It will have been gathered that my own opinion is that purity of blood in breeding is of the greatest advantage, provided always that it is used with discretion and discrimination. One of the largest and most successful of Shorthorn breeders—never a gambler in them—said but recently that his herd is now so truly bred that before he sees the calf he

knows almost exactly what it will be like, and the calves are as alike as it is possible to be. The maintenance of purity of blood is of course essential. Once allow in an underbred, bad cross, and it will take a very long period to eradicate it. It must be left to the breeder's judgment and his knowledge of his requirements as to the judicious use he should make of the pure-bred animal that will be of most service to him. It is highly advantageous that not only does there exist a very wide choice of pure-bred animals, but that there is great accessibility, in a pecuniary sense, to them. All pure-bred animals are at present comparatively cheap, but farmers should not forget that now and again the old saying of "cheap and nasty" is exemplified.

In any case, whether we give 20*l.*, 40*l.*, or 100*l.* for a bull; 5*l.*, 10*l.*, or 20*l.* for a ram; 3*l.*, 5*l.*, or 10*l.* for the service of a stallion, it is always prudent to first inquire carefully into his pedigree, his bringing up, and his antecedents. With the exercise of these precautions, I am most strongly of opinion that a breeder will never repent using a pure-bred animal, be he a horse, a bull, a ram, or a boar. To support my opinion I may quote from a little catalogue recently issued: "Good blood with good management is the best surety for reproduction," and "a good beast is a good beast however it has come, but to pedigree alone must we look for succession."

To conclude, I may remark that, while each breeder is entitled to his own opinion, I still maintain that pure-bred animals are what we should endeavour to obtain, provided we can get them of robustness and symmetry that come up to our standard, and I do not think we shall have much difficulty in doing so. Whether in cattle, horses, sheep, or pigs, we are very much indebted to the trouble which breeders have taken to get—and to keep—their stock good and pure, and I feel that those who use pure-bred animals will have a great advantage over those who use animals not so pure-bred. I cannot, however, too strongly insist upon the necessity of getting our animals as robust as possible, for this is a primary condition of successful breeding.

NIGEL KINGSCOTE.

THE EVOLUTION OF AGRICULTURAL IMPLEMENTS.—I.

Agricultural implements, although the oldest of all mechanical devices, have improved very slowly since the earliest times of which any records exist. The same slowness, indeed, characterises equally all improvements in agriculture itself, the art being one whose experiments exhaust human life for their solution, and refer to the whole catalogue of the sciences for the principles on which they depend.

Saving in certain portions of Western Europe, and in North America, the agricultural machinery in use at the present time is scarcely in advance of that which was described by Herodotus nearly 2,000 years ago. In the East, the plough had been introduced many centuries before the Christian era, as the Hebrew Scriptures, and the monuments of Egypt, Assyria, and Babylonia, demonstrate. Colonies, migrating at dates of unknown remoteness from Asia into Europe, had established centres of agricultural industry, and even the manufacture of ploughs, both in Germany and Gaul, a thousand years before the birth of Rome. It was from these countries that Britain, receiving her earliest inhabitants, obtained also such tillage implements as were found in use there by the Romans on their arrival. Roman writers acknowledge their indebtedness to Egypt, Phœnicia, Greece, Germany, and Gaul for their implements of husbandry, and Varro and Virgil, writing in the last century B.C., speak of the Roman plough as then in course of supersession by that of the two latter countries.

The Egyptian plough had a share, but no coulter or wheels. Early Greek ploughs had wheels as well as shares. Pliny and Virgil describe the plough of Cis-Alpine Gaul as having wheels, and being drawn from shafts. Strutt's *Saxon Rarities of the Eighth Century* figures a Saxon wheel-plough, and his *Complete View of the Manners of England* a Norman wheel-plough. The Harleian MS. shows a swing-plough drawn *from the tails* ot oxen, a practice which, in 1634, it required a statute of the Irish Parliament to abate; while, finally, the Bayeux Tapestry illustrates Saxon ploughs, having coulters, shares, and wheels.

Mechanically speaking, these primitive ploughs were all equivalents of the modern cultivator, or "smasher," being each a simple wedge hauled through the soil by means of a beam or

pole fastened to its heel. It is an interesting fact, of which more hereafter, that modern practice, after having long abandoned "smashing" in favour of the neatly turned furrow-slice, is now returning to the same system of ploughing as that which distinguished the earliest efforts of man to cultivate the soil.

The seed, after being scattered, either from the "seed-box" or "sowing-sheet," was usually ploughed in by the ancients; but the Egyptians, Romans, Saxons, and Gauls used for this purpose an implement distinct from the plough, which, slightly scratching the soil, effected what Roman writers call its "scarification," the equivalent of modern harrowing. The Assyrian monuments demonstrate that a drill-plough was used at least 500 years before Christ, and a figure of it is given in Mr. Allen's *Digest of American Seeding Machines.*

Pliny says that the Romans employed two-handed scythes as well as one-handed sickles, and that with the former a man could mow a "jugerum," or about three-quarters of an acre, of hay daily. The tyer, who, in Roman times, followed the mower, is described as making 1,200 bundles of hay, weighing 4 lb. each, in a day, and these bundles were stored in barns like grain. Corn was reaped by the Romans with a sickle, cutting half-straw high, and the grain was bound into sheaves and stored in barns ready for threshing.

Upon none of the Egyptian monuments, on the other hand, is the long-handled scythe depicted, a smooth-edged sickle being used for cutting hay and a serrated sickle for corn. Only the ears of wheat were cut off by the Egyptians, and these were carried in baskets to the granary, whence they finally found their way to the pestle and mortar, which freed the grain from chaff.

Pliny has described a Gallic reaping-machine, and Varro also mentions, without describing, a reaping-machine which he had seen in Germany. There is little doubt that the latter, like the former implement, consisted of a row of closely-set prongs which, being urged forward by a pair of oxen, snatched, or stripped, the ripe ears of corn from the straw and delivered them into a box provided for their reception.

Ancient threshing-machines consisted of the floor and the flail. Grain was usually separated from the straw by "the ox that treadeth out the corn," but Isaiah makes poetical mention of what might well have been rollers drawn over the threshing-floor to complete the separation of grain and chaff. The Roman "tribulum" had a similar function, and was drawn by means of oxen over the crop to be threshed. The mortar was used, as

in the East at the present day, for the purpose of freeing wheat from chaff, an operation which was also frequently accomplished by partial burning or "parching." The flail is of immense, but unknown, antiquity, and so also is the "rippling" comb, still commonly used in the far East for separating rice from its straw.

The grinding-mill, the last example of ancient agricultural machinery demanding notice, was used in prehistoric times, and references to it are common in the earliest writers. Familiar, however, as are the forms and character of the quern, the Etruscan sheller, and the Pompeiian and Egyptian mills, it is not generally known that the modern roller-mill had its ancient equivalent. Niebuhr, in his work on Arabia, published in 1772, describes and figures a hand roller-mill which he was assured by the Arabs, and found upon trial, made better flour than the quern. Nor was this Arab equivalent of the most modern of modern mills any rude affair. On the contrary, it was made with the highest artistic skill, as Niebuhr's illustration, adopted by Taylor, Smith, and other writers on early Hebrew milling, sufficiently testifies. Livingstone, too, found a rude roller-mill in use among certain African tribes, and so fine was the flour it made that the good missionary concludes his notice of it by suggesting that such may have been the mill with which "Abraham made fine flour for the angels."

Few and rude as were the tillage implements of antiquity, they were scarcely added to, or improved, in Western Europe down to the close of the last century; agriculture being one of the latest arts to feel the influence of that mighty revolution in industrial methods which, originating in the genius of Arkwright and Hargreaves, Crompton and Watt, Brindley and Telford, has practically resulted in making the mechanic the dictator of the modern world. Such as the improvements were which first followed upon several thousand years of stagnation, they will be briefly noticed, each in its place, as the various agricultural implements of the present day come under review.

Farm machinery falls naturally into the following classification:—

1. Tillage implements,—including ploughs, cultivators, harrows, rollers, and clod-crushers.

2. Seeding implements,—including drills, whether for seed or manure.

3. Harvesting implements,—including reaping- and mow-

ing-machines, haymakers, horse-rakes, stacking-machines, hay and straw compressors.

4. Machines for preparing crops for market,—including threshing-machines, elevators, and winnowing-machines.

5. Machines for preparing crops for food,—including grinding-mills, chaff-cutters, root-cutters, oil-cake breakers, and gorse mills.

6. Dairy appliances,—including cream separators, churns, butter workers, refrigerators, and cheese presses.

To these six classes, including machinery of strictly agricultural character only, there must be added as follows:—

7. Prime movers.

8. Drainage machinery,—including draining-ploughs, trenching-machines, and pipe-laying apparatus.

9. Appliances for the reclamation of land,—including steam-ploughs of special construction, discers, and pulverising harrows.

To the above machines, all of which are closely connected with the conduct of ordinary agriculture, there might very properly be added appliances for road-making, the irrigation of land, the manufacture of manures and cattle foods, the washing, drying and packing of hops, the retting, breaking and scutching of flax, and mechanical forestry. It will, however, sufficiently extend the space of this essay to sketch the history, state the functions, and describe the more important of the machines already enumerated.

Class I.—Tillage Implements.

Ploughs.—It was not until the middle of the seventeenth century that the rude plough of antiquity was improved in any important particular, its development, in the first instance, taking rather a remarkable course.

In 1649, Walter Blith, an officer of Cromwell's army, described, in a book called *England's Improvement*, a double-furrow plough, in form like two ordinary ploughs having their respective beams secured together, the handles of the front plough and the fore part of the hind plough being both cut off. In 1730, Ellis, of Hoddesdon, Herts, followed with an improvement on Blith's plans, and such was the success of these two implements that Arthur Young, writing in 1771, speaks of the double plough as in high favour and in extensive use among farmers of that day. In 1802, Lord Somerville, who gave much time and thought to this subject, patented a form of double-furrow plough having only one beam, curved in the middle so as to adapt it for carry-

ing two breasts. He was shortly followed by Handford, a Leicestershire ploughwright, whose adjustable double plough had beams which could be set for any given width of furrow by means of screwed stays.

But the difficulty of turning these heavy implements at the land's end soon favoured improvements in single ploughs, one of which, brought from Holland in 1730 by the Earl of Stair, and patented in Scotland under the name of the "Dutch Plough," was soon much appreciated and largely sold. In the same year, Stanyforth and Foljambe, of Rotherham, patented certain improvements in the "Dutch Plough," and, for thirty years subsequently, the "Rotherham Plough," as this implement was called, remained typical of the best ploughwright's practice, and enjoyed considerable success.

In 1760, Small, of Black-Adder Mount, Berwickshire, brought out the "Scotch Swing Plough," an improvement on the "Rotherham Plough," having a wrought-iron beam and handles and a cast-iron mould board. Small's plough did better work, with less draught, than its predecessor, which was made almost wholly of wood, and its rapid growth in popularity gave a great impetus to improvements of various kinds in single-furrow ploughs, the Berwickshire implement, however, continuing to form a model for all its successors.

In England, a Suffolk blacksmith, named Brand, was the first to make an iron plough, which is mentioned with high praise in Arthur Young's *Report on the Agriculture of Suffolk*. In 1785, Ransome first tempered, and, in 1803, first chilled the ploughshare, and about the same period, Simpson, of Cretingham, invented the slade. Following Simpson's lead, Ransome, in 1808, patented a plough body which could be taken to pieces and its parts replaced by the ploughman in the field, and since that time no radical changes have been made in the principles governing the construction of ploughs.

Modern ploughs divide themselves into four classes:—

1. Swing-ploughs.
2. Wheel-ploughs.
3. Turnwrist-ploughs.
4. Double, or multiple, furrow-ploughs.

The swing and wheel ploughs differ from each other only in the absence or presence of wheels, the former, descendants in all cases of Small's plough, being generally of Scotch, and the latter of English manufacture. Controversy as to the relative merits of swing and wheel ploughs is as old as it is persistent. The former require rather more skill in handling, while the latter need a better condition of the land for making good work. The

draught of wheel-ploughs is claimed to be less than that of swing-ploughs, although certain experiments of the Ayrshire Agricultural Association, made at Rozelle in 1843, have proved that some of the best English ploughs draw as light without their wheels as with them.

Turnwrist-ploughs, sometimes called "one-way ploughs," because they turn their furrows in one instead of alternately opposite directions, are made on four different plans. 1. The mould board turns over from left to right, and *vice versâ*, as in the American hillside-plough. 2. One or more plough bodies revolve on an horizontal axis, forming the beam, one set standing vertically while the other is at work. 3. Two or more right- and left-hand plough bodies are balanced, as in Fowler's well-known steam-plough, and used in the same manner. 4. Two ordinary plough bodies, a right- and left-hand one, are placed back to back with the ends of their mould boards almost in contact. Both mould boards are attached to a frame supported on a central wheel which acts the part of a slade, and upon which the two plough bodies are balanced. The handles and beam are pivoted to a vertical stud rising from the centre of the plough frame already described. They can thus be swung round horizontally, while the ploughs themselves remain stationary, looking in opposite directions. Catches, under the control of the ploughman, are provided to fix the handles in the proper position for ploughing in either direction, and, when the implement has arrived at the end of the furrow, the horses, in the act of turning, bring these into line for the return journey. This plough, patented by Muriston in 1876, is really a modification of, and improvement upon, a clever turnwrist-plough first introduced in 1844 by Lowcock, a village ploughwright, of Marldon, Devon.

Something has already been said of the double-furrow ploughs, whose rise so singularly distinguished the last century. These, for the reasons already cited, had long passed out of use and been forgotten when Pirie's plough appeared in 1868. This well-known implement consists of two plough bodies carried on a wrought-iron frame, supported by three wheels, of which two, having oblique axles and "V"-shaped tyres, run, one in the furrow and one on the land. The leading furrow wheel is steered by a lever and plough handles are dispensed with. The treads of the furrow wheels are brought, by means of their inclined axles, into the angle of the furrow usually occupied by the slade, and the plough rolls, instead of sliding, forward, with the result that two furrows are cut almost as easily as one by the common plough.

The objection to Pirie's plough—as to the double-furrow ploughs of Blith, Somerville, and Handford—was the difficulty of raising and turning in at the headland. Smith, of Woolston, was the first, in 1855, to patent a device which, improved by Ransome in 1873, has now completely obviated the trouble in question. The plough is provided, about the centre of its length, with a through axle, cranked at each end, and carrying a pair of travelling wheels. When the implement is at work, the cranked axle is in such a position that its wheels are off the ground, but, on the ploughman releasing a catch, the wheels take the ground, the onward movement of the horses rolling them under the plough, and raising it at the same time, until the cranks are vertical, when they come against a stop, and the implement rides about like a cart. Other makers accomplish the same result by means analogous to those employed by Ransomes; but this ingenious device, the invention of Jefferies, first made it practicable for ploughs having two or more beams to be easily raised and turned in at the land's end.

The function of the plough being that of turning the soil for the purpose of exposing new surfaces to the action of the atmosphere, opinion has been much divided as to the form of mould board best adapted for effecting this object. America and England have taken opposite views of this question, the former country adopting short, and the latter long plough breasts. Down to 1840, indeed, English practice in this respect varied a good deal; but after that date, and until recently, the prizes awarded at ploughing matches fell almost invariably to such ploughs as, having very long mould boards, turned furrow-slices of rectangular section and laid these down with the utmost regularity, one upon another, at an inclination of 45 degrees. Since the discontinuance of ploughing competitions by the Royal Agricultural Society, however, this artificial ideal of good ploughing has materially changed its character, and the short American breasts, which pulverise the furrow-slice in the act of inverting it, have come into favour in this country.

A word as to the short-handled American and long-handled English ploughs. A plough, in the hands of a good ploughman, needs very little guiding, because he sets his irons so that neither coulter nor share have more than the minimum tendency either to hug or leave the soil, while plough handles are levers giving the ploughman power to correct these tendencies, at the expense, however, of friction and draught. Hence the remark, common at ploughing matches, that the man rather than the machine wins the prize. From this, the correct, point of view, long handles may be regarded as snares for ploughmen, a remark

whose significance is emphasised by the fact that handles are altogether discarded in the best modern examples of double-furrow ploughs.

It is surprising that the "gang," or pole-ploughs, common in America, have made so little headway in this country. These ploughs are guided by a pole and carried on two large wheels, one of which treads in the furrow and the other on the land, thus supporting both the weight of the implement and the down thrust of the share upon rolling surfaces. "Gang ploughs" are commonly double or multiple furrow implements, making use of a cranked axle, similar to that already described, for regulating the depth of the furrow and for raising the plough at land's end. The ploughman drives his team from a suitable seat, as in a mowing- or reaping-machine, his weight adding scarcely at all to the draught of the plough. There are numberless varieties of this plough in use in the United States, but only two English makers have ventured as yet to follow the American lead, and that with little success. Howard, of Bedford, and Cooke, of Lincoln, both showed pole-ploughs at the Royal Agricultural Society's Show at Derby in 1881, but these implements have made no appreciable advance in this country since that time, prejudice being, apparently, the only real obstacle to their successful employment.

It is now rather more than a quarter of a century since the late Mr. John Fowler, speaking before the Society of Arts, anticipated that the general adoption of steam cultivation would save this country twenty-five millions sterling per annum—or half its yearly bill—for horse power employed on the land. Mr. Fowler's anticipation was too sanguine; but steam-ploughing, which, at that time, was little more than an idea "conceived," to use his own words, "in the minds of those who are rather poets than mechanics," has at least proved a complete mechanical and commercial success.

Space forbids any attempt to discuss steam tillage within the four corners of an essay proposing to deal with farm machinery generally, nor is it needful to say more than a few words on this question in view of the fact that the Transactions of the Royal Agricultural Society, the Farmers' Club, the Society of Arts, and the Institution of Mechanical Engineers have already been enriched with exhaustive communications on this interesting subject from Mr. J. A. Clarke, Mr. Fowler, Mr. Greig, Mr. Howard, Mr. J. C. Morton, and other writers of eminence.

Briefly, however, the experience of the last forty years may be said to have demonstrated that steam tillage is best accomplished by means of two self-moving winding-engines,

stationed one at each headland, between which the plough is drawn back and forth by means of a steel-wire rope.

When only one engine is employed, "the self-moving anchor" offers the best substitute for the double-engine plan. Under this system the plough is hauled backwards and forwards between a self-moving winding-engine and a so-called "anchor," which consists of a strong wrought-iron framework, supporting a horizontal sheave, around which the tractive rope passes on its way to and from the winding-engine. This framework rolls on four thin discs, which, while acting the part of wheels, sink deeply into the ground and provide the necessary resistance against the pull of the rope. After each bout, the tractive rope hauls the anchor automatically along the headland far enough to trace a second set of furrows, which done, the anchor is itself secured fore and aft by tines, and these again are lifted automatically out of the ground by every approach of the plough.

A third plan of ploughing is known as the "roundabout system," and in this, as the name implies, the tractive rope, supported on horizontal sheaves fitted with suitable anchors, makes a four-square or other convenient circuit of the field. An ordinary farm engine, giving motion to a pair of winding drums, is used for the purpose of hauling the rope to which the plough is attached, at the side of the circuit most distant from the engine. After every bout, the pair of anchors between which the plough is thus caused to travel are moved by hand, and so, step by step, the field is ploughed.

Fisken's clever plan of transmitting the power required to haul the plough by means of a light rope running at a high velocity, forms a fourth plan of steam tillage, but it has never come into extended use.

Digging Machines.—There is no question but that the introduction of steam-ploughing proper was long retarded by the firm hold which the idea of "rotary" cultivation had taken on the public mind, thanks, in a great measure, to the clever writings of Mr. Wren Hoskyns. At the time when the use of tractive ropes was first suggested, Romaine, Usher, Boydell, and others were trying hard to prove that steam tillage should be effected by self-moving engines, drawing either ploughs or revolving cultivators behind them, and large sums of money were spent in demonstrating the impracticability of this plan before agricultural engineers settled down to the conviction that they must seek the solution of the steam-tillage problem in haulage.

Of the many horse-power diggers which have at various times been introduced as rivals of the plough there is no need to speak, for they have all failed. But that "digging" has

still an extraordinary fascination for certain inventors is shown by the persistent appearance at agricultural shows of steam digging-machines. These implements, ingenious and mechanically meritorious as many of them are, have, as yet, accomplished little, although it must be said that both the Darby and Proctor "Diggers," making use of steam-driven spades, are interesting improvements on the earlier machines of this class.

Cultivators—sometimes called "Grubbers," or "Scarifiers,"—are tillage implements having strong curved teeth, capable of penetrating and stirring the land as deeply as the plough, whose operations they may either supplement or supersede. The cultivator frame is carried upon wheels, which prevent its curved teeth from burying themselves in the soil, as they would do if left unsupported; and these wheels are capable of being lowered, or raised, for the double purpose of determining the depth of the cultivation and enabling the machine to travel.

Finlayson's Grubber, patented in 1824, was simply a large harrow, with curved teeth carried on three wheels, each about a foot in diameter, of which the leader, having an axle mounted on a bell crank, could be thrown up and down by means of a lever raising the tines sufficiently to enable the machine to be turned in at the headland. When travelling, the hind wheels were raised by a rack and pinion.

Scoular soon improved on this arrangement by mounting the hind wheels as well as the leader on bell-cranks, all operated by the same lever, giving a parallel lift by means of a device which has not since been surpassed in simplicity. In the "Uley Cultivator," first shown in 1843, Earl Ducie carried the rear of the grubber upon a pair of wheels furnished with a cranked axle, the crank itself being connected by means of a sway-bar with the axle of the leading wheel in such a way that this. moving in a vertical slide, was caused to rise and fall *pari passu* with the cranked axle and give a parallel lift to the frame.

Biddell's Cultivator, patented in 1843, had separate lever lifts, one for the leading, and one for the rear wheels. Only the first was used for turning in, and both together for travelling, but the arrangement was rather heavy and cumbersome.

All these implements, however, may now be said to belong to history, and it is to be remarked that the cultivator attracted more attention from the farmer twenty-five years ago than it does at the present time. In demonstrating the enormous shattering power of the grubber, when moving quickly through the soil, steam traction has itself done a great deal towards discouraging the use of this implement in connection with horse-power.

Among modern cultivators, that of Clay may be selected as a type exhibiting a very excellent combination of qualities. The curved grubbing tines of this implement are secured to a square bar of iron in such a way that they can be shifted laterally upon it, and again keyed in place, with great facility. A high lift, giving an easy entry to the points of the tines, is obtained by rocking the square iron bar in question by means of a long lever, while the form of the tines is such that, when fully raised, they clear themselves of stubble, weeds, &c., by the action of gravity. When broadshares are used instead of tines their pitch can be regulated with the utmost ease and nicety. The well-known and excellent cultivators of Coleman and Morton must not be omitted from mention in this brief review of a class of implements of which Clay's is probably the most interesting to the mechanic.

Harrows.—The function of a harrow is exactly that of a gardener's rake. It is used either to prepare a seed bed or to cover seed. In the one case, it operates by breaking clods, bringing weeds to the surface, and making a tilth; in the other, by dragging down the sides of the furrows in which the seed is left by the drill.

Armstrong's zigzag harrows, patented in 1839, are the parents of all the tined harrows of the present day, modern improvements in these implements being almost entirely confined to the perfecting of devices for the more efficient fastening of the tines to the frame, to jointing the latter in order to give flexibility, and to folding the tines themselves for facility of packing.

"Web" or "chain-harrows," consisting of interwoven links having the appearance of coarse chain armour, were first invented by Smith, of Deanston, in 1842, and are used chiefly for cleaning grass land in the early spring.

Clod-crushers and rollers are in almost constant use on the farm during the spring and summer months, reducing cloddy surfaces to tilth, consolidating land loosened by frost, or pressing it around the roots of springing crops.

With regard to rollers, it is only needful to call attention to the plan, introduced by Barford, of filling closed cylinders either with water or sand, thus economising materials while securing a maximum weight in the roller.

The well-known Crosskill Clod-crusher, patented in 1841, is a roller consisting of numerous serrated discs strung loosely on an axle, and having a function sufficiently indicated by its name. Of this simple and effective tool it is only needful to repeat the common remark that it is, for its purposes, "beyond the reach of improvement."

Class II.—Seeding Implements.

The first sowing-machine of which any record exists was invented by Joseph Locatelli, of Carinthia, and not only appears to have been successfully tried in 1662, but made in some numbers, and even exported to England, where an agent for its sale was appointed. Cooke's drill, patented in 1783, was, however, the foundation of all the drills now in use, and the immediate predecessor of Salmon's "Bedfordshire," and Smyth's "Suffolk" drill, introduced about 1800.

Sowing-machines fall naturally into the following classes:—

1. Cup drills.
2. Tooth and brush pinion drills.
3. Disc drills.
4. Chain drills.
5. Force feed drills.
6. Liquid manure drills.
7. Potato planters.

Mr. Allen, of the American Patent Office, indeed, in his digest of American seeding machinery, divides drills into thirty-five classes, and says that, before the fire of 1877, the Washington Patent Office contained more than 3,000 models representing patented improvements in seeding implements. It will, however, be sufficient for all practical purposes to detail the more, and sketch the less, important peculiarities of the seven classes of drills which have been named above.

A good drill should,—First, deliver uniformly the same quantity of seed per unit of surface, whether travelling on level ground, along the side of a hill, or up and down hill. It should adapt itself not only to all kinds of seeds but to all conditions of such seeds. The quantity of seed sown per unit of surface should be precisely and easily regulable.

Secondly,—the coulters should make the seed-furrow neither too deep nor too shallow, and the sides of this furrow should fall in easily upon the seed.

Thirdly,—the steerage of the machine should be easy and accurate.

First—Delivery.

The well-known cup drill (Class 1), now practically universal throughout Europe, should give, theoretically speaking, a perfectly regular delivery if the cups were all of the same capacity and set at the same angle to the diameter of the cup wheel. In practice, however, these conditions are not easily obtainable, while, even if they were, the reaction of the cups on rough ground often throws a portion of their contents back into the seed-hopper.

Tooth and brush pinion drills (Class 2) have the bottom of the seed box pierced with holes, which are covered by a revolving pinion having teeth alternating with brushes, whose revolution sweeps out the seed with some approach to regularity: but the canting, on hillsides, of the grain to be sown renders this drill unfit for use on any but level fields.

Disc drills (Class 3) are similar to pinion drills, the pinion being, however, replaced by a disc having waved edges, which alternately open and close the holes in the seed box, bringing some seed forward at the same time, just as an endless screw might do. These seeders are also unfitted for hillside work.

In *chain drills* (Class 4) the seed falls from a hopper on to an endless chain, by which it is conveyed to the discharging funnel. This drill acts well on hillsides, but has an uncertain and irregular delivery.

Force-feed drills (Class 5), commonly used in America, where they were first introduced in 1851, are still regarded with distrust by most of the eminent English makers. The bottom of each seed-hopper is closed by a small spirally grooved roller, which, revolving as the machine advances, supplies seed in a regular stream to the discharging funnel. The speed of the roller is constant, the quantity of seed sown being regulated by sliding the feed roll laterally, and thus exposing a greater or less length of the feeding grooves. A "follower," or blank portion of the roll, closes the aperture in the hopper which this movement would otherwise occasion.

Liquid-manure drills (Class 6), first patented by Chandler in 1847, are a combination of the cup drill with an apparatus for supplying a dose of liquid manure to each portion of seed delivered to the furrow. This is accomplished by mounting the drill proper on a reservoir of liquid manure, furnished with an endless band of cups, which, revolving as the machine advances, carry up each a measured quantity of the fluid fertiliser and discharge it into the same funnel as that which receives the seed, seed and manure thus finding their way together to the soil.

The difficulty of distributing moist manures has been recently overcome by a very ingenious drill, the invention of Schlor of Vienna. This machine consists of a manure-box, carried centrally between two travelling wheels, over the edge of which the contents are shed by means of a spindle thickly set with spirally-disposed studs. While these revolve the bottom of the manure-box rises slowly, causing a thin, even stream of manure to fall continuously to the ground. This drill was exhibited for the first time in this country by Coultas at the Doncaster Show, 1891.

Potato drill (Class 7).—This clever modern machine, patented in 1875 by Ferguson, consists of two large iron hoppers, containing the "eyes" or "sets" to be planted, and mounted on a pair of travelling wheels from whose axis an endless chain, formed of a series of cups, passes upwards through each hopper, every cup taking up a "set" in its passage. The "sets" then fall into a tube, through which the endless chain itself returns, and as each cup emerges from the bottom of this tube an "eye" drops into the furrow. Two mould boards follow close on the falling seed for the purpose of covering it with soil.

Secondly—the Seed Furrow.

All the best drills deliver their seed into a funnel-shaped tube terminating in a heavy coulter, which, either sinking by its own weight, or being forced into the soil, traces a shallow furrow therein. The sides of this furrow should fall in quickly and easily upon the seed; but so much pressure has sometimes to be applied to the coulter that the little walls of earth which ought to be left in a loose and friable state frequently become "glazed," with the result that the seed is not completely and quickly covered. The Americans have recently tried to remedy this defect by using a coulter of circular section cut away obliquely behind, and having its nose turned up like a hog's snout.

Thirdly—Steerage.

For drilling to be quite regular, every passage of the machine across the field must be exactly parallel to its predecessor, and it is quite impossible to ensure this by simple skill in driving, as was attempted in Cooke's early machine.

To obviate the difficulty, James and Jonathan Smyth brought out the "Suffolk" drill, a machine fitted with a swing-steerage of the seed and manure coulters. Salmon, of Woburn, introduced his Bedfordshire drill in 1801, with steerage of the two supporting wheels in the rear. This machine has since been improved in details, but both its steerage and general principles of construction survive to the present day. In 1838, Lord Western first patented a drill with fore-carriage steerage, and, in 1842, Messrs. Garrett added fore-carriage steerage to Smyth's "Suffolk" drill.

The trials of corn and seed drills, conducted by the Royal Agricultural Society at Bedford in 1874, clearly evidenced that, so far as their most important function, regularity of seeding, is concerned, this class of implement is still open to consider-

able improvement. The best cup drills showed a difference of 7 lb., and the worst of 40 lb., per acre between the greatest and smallest amounts of seed received by two furrows traced by the same machine. The "force feed" drill, on the other hand, has a practically perfect delivery. Its discharge does not vary more than 10 ounces per acre under the worst circumstances, and a machine constructed on this principle, and tested by the British Commissioners at the Philadelphia Exhibition, did not vary more than two ounces per acre, while its performance was absolutely unaffected when working at inclinations of 30 degrees.

Class III.—Harvesting Implements.

In 1780, the Society of Arts offered a gold medal for the introduction of a reaping-machine, and continued this offer, without practical results, for more than thirty years.

Mr. Capel Lofft, of Troston Hall, Bury St. Edmunds, drew the attention of Arthur Young to this offer, and was told by him of the Gallic Reaper, which has already been alluded to. Surprised that this machine should have been so long neglected, Lofft sent Young translations of Pliny and Palladius describing it, together with notes suggesting certain improvements on this early piece of mechanism. Mr. William Pitt, of Pendeford, responded to the stimulus thus imparted to the question by the invention of a "Rippling" machine, of which Young gives an illustrated description in the eighth volume of the *Annals of Agriculture* (p. 161). This apparatus consisted of a number of circular saws mounted on a common axis, and set closely together, so as to form a serrated cylinder which, in revolving, snatched the ears from the straw and threw them into a collecting box. When the box was full of ears it was removed and sent to the threshing-machine, the reaper continuing its progress.

It was not until April, 1812, that John Common, a millwright of Denwick, Northumberland, laid a machine before the Society of Arts which embodied all the essential principles of the modern reaper, having reciprocating knives, open finger guards, a swathe delivery, and a reel for bringing the standing grain to the cutters. Common made three different reapers in 1811-12, but ceased from working on the problem in the latter year, partly on account of the mechanical difficulties to be overcome, but chiefly because of the popular clamour raised against his machine. This was so great that his early trials were made by moonlight, the Duke of Northumberland, who was greatly interested in them, assisting at more than one of these midnight essays.

In the course of his experiments, Common had recourse to the Browns, father and son, of Alnwick, clever mechanics and founders, who substituted iron for wood in many parts of his machines, and themselves became, later, makers of an improved machine which was sold in some numbers about 1822. In 1824 the Browns left Alnwick, and shortly afterwards emigrated to Canada, taking with them models of Common's reaping-machines. Ultimately, they removed to Sterling, in Cayuga County, New York State, where the father became a farmer, and so died in 1850. McCormick, the reputed originator of the reaping-machine, lived at Auburn, about twenty miles from Sterling, and knew the Browns well. From them he obtained a model and description of Common's machine, and there is little doubt that the reaper with which he competed at the trials of Harvesters, held at Auburn by the New York State Agricultural Society in 1846, was the child of those models and the father of the McCormick machine which obtained such notoriety at the London International Exhibition of 1851.

The development of the Gallic Stripper, arrested by Common's invention in England, was continued with considerable success in America. Its chief defect, that of requiring a rake-man to keep the rippling comb clean, was obviated by Ashmore and Peck, who, in 1835, introduced what is now known as the "reel." In 1836, Carpenter, of New York, adapted the reel to the threshing of the ears after they had been snatched from the straw; while in 1844, Easterly, of Heart-prairie, Wisconsin, introduced an improved "header" (as this class of machine was now called in the United States), capable of cutting twenty-five acres of wheat per day. This machine, which, on its appearance, the highest agricultural authorities in America regarded as of "great promise," soon made itself very popular in the large grain-growing farms of the Far West, where, indeed, it held its own until the introduction of the sheaf-binding reaper in recent days.

Fifteen years after Common's first experiments, or in 1826, the Rev. Patrick Bell brought out the well-known machine, still bearing his name, with an endless apron which received the cut grain and discharged it in swathe at the side of the horse track. For more than thirty years this method of delivery remained without improvement, and a great number of machines, made either on Bell's plan or that of Burgess, in which travelling aprons were replaced by endless screws, were successfully used in this country.

In 1851, however, Seymour, of Brockport, U.S.A., introduced a reaper in which the grain was discharged in sheaves

by the action of a reciprocating rake. This machine, improved by Morgan, was patented by Seymour and Morgan in England in 1858, and made a favourable appearance in light crops.

In 1862, Samuelson & Co., of Banbury, introduced from America the "Dorsey" reaper, which sheafed by means of revolving rakes, a device rudely anticipated by Salmon in 1806. The "Dorsey" machine soon set the fashion for sheaf-delivery, and, while greatly improved at the hands of various English makers, it remains the type of all modern self-rakers.

These, in the first instance, did not size the sheaf, but threw off the grain at regular intervals, without reference to variations in the weight of the crop. It was not until 1869 that Johnston, Huntley, & Co., afterwards the Johnston Harvester Co., of Brockport, U.S.A., first introduced into this country a "controllable" self-raker, in which machine the driver could determine, by a movement of his foot, whether any given rake should clear the platform of grain or pass over it. This reaper, which, being at that time unsuitable for English crops, took no prominent position at the Royal Agricultural Society's trials at Manchester in 1869, was, nevertheless, so great an advance on all existing sheafers, that, in the course of very few years, every English manufacturer was compelled to adopt either the Johnston "switch" or some equivalent device for placing the rakes under the control of the driver.

Although England, as has been shown, was the parent of the reaping-machine, America has proved its more solicitous nursing mother. Scarcely had English makers settled down to the manufacture of the "Dorsey" sheafer than America showed them how to size the bundles of grain, and while the English mechanic was still busied in following this new lead, his Yankee rival stepped again to the front with the self-binding reaper, whose evolution may be summarised as follows:—

In 1811, Common first invented, and, in 1826, the Rev. Patrick Bell re-invented, a reaper which delivered the corn in swathe at the side of the machine, discharging it from a travelling apron.

In 1849, Mann, of Clinton, Ohio, added a second delivery apron to that of Bell, and by means of this carried the cut grain over the drive wheel, discharging it into a receptacle, whence it was delivered at intervals in sheaves.

In 1851, Watson and Renwick, of Chicago, adopting the Bell and Mann aprons, added a mechanical binding device which, using string for the band, was, in effect, the string-

binder of to-day. But this machine failed in practice, and the matter slept for several years.

In 1867, Wood and Lock, adopting the Bell and Watson and Renwick aprons, added a wire-binding device thereto, and, after three years of experiments, produced a machine which was a practical success. The first wire-binder ever seen in Europe was exhibited by W. A. Wood at Vienna in 1873. Wire-binders by various makers were sold in large numbers between 1870 and 1879 in the States, but the outcry of farmers and millers against wire as a binding material caused it to be abandoned.

In 1878, the Johnston Harvester Co. exhibited a string-binder at the Royal Agricultural Society's Show at Bristol, but subsequently abandoned the manufacture of this machine in favour of the "Appleby," next to be mentioned.

In the same and following years, 1878–9, Appleby obtained American patents for a string-binder which has since proved very successful, and, being unprotected by patents in this country, has been adopted by all the English makers of self-binding reapers as a model.

In 1879, Wood and Holmes produced their first string-binder, and this, together with Appleby's machine, are the only practical self-binding reapers yet before the English public.

In 1889, Wood showed, for the first time in Europe, a "straw-binder," which, substituting straw for string, made a promising though not perfect performance on the trial-fields at Noisiel during the Paris Exhibition of that year.

The self-binding reaper is the most ingenious and interesting agricultural machine in existence. To describe it fully within the limits of this essay would be impossible, and the task is rendered unnecessary by the excellent account of the "Appleby" machine appearing in Mr. Coleman's report of the Derby trials published in the Journal (vol. xviii. s.s. 1882). Briefly, however, it may be said that the cut grain is first carried to one side of the machine, and then lifted over the driving wheel by means of endless webs. These deliver it to an incline, down which it falls until stopped by a lever which opposes its further progress. Against this the grain is "packed," until a bundle big enough for a sheaf has accumulated. Then the lever, which is arranged to yield before a predetermined pressure, gives way, and in so doing puts the "binder" into gear. A curved arm, the exact equivalent of a sewing-machine needle, threaded with string under a given tension, rises from beneath the incline and encircles the bundle with a cord, whose end it leaves in the grasp of the "knotter." Finally, this clever device first ties and then cuts the string

band, leaving the sheaf free to be thrown off the machine by a pair of arms provided for that purpose.

It is not unlikely that binders will in future be greatly simplified by dispensing with the vertical apron. Adriance, Platt, & Co., of Poughkeepsie, New York, showed at the Doncaster Meeting, 1891, a reaper in which, by means of a roller fitted with gathering arms, the corn is taken directly from off the platform apron, and passed into the sheafing apparatus. This machine is lighter in draught, and simpler than the double apron binder, while it did good work in heavy laid crops, and looked altogether like a promising new departure in harvesting machinery.

Manual delivery reapers were largely used both before and during the introduction of the sheafer and binder, and still, indeed, find a considerable field of usefulness. In the early days, manual side-delivery of the sheaf was often attempted, and sometimes accomplished, by strong and skilful men working in average crops. But the work was too severe for ordinary labourers, and "back-delivery" soon became the rule in all manual machines. Tipping and slatted grain platforms make this form of delivery light work, and when men enough can be found to bind the grain and remove it from the track of the machine as fast as cut the plan is a good one.

Mowing-machines have practically the same history as the reaping-machine, but the problems to be solved differ in some important points in the two implements. The cutting of straw by means of reciprocating knives is easy; but grass, and especially meadow grass, is much more difficult to deal with. Cutting apparatus that will keep perfectly clean in the one case becomes hopelessly clogged in the other, and it was long before a knife and finger were found capable of mowing in foul meadow bottoms without choking.

Hussey's "guard," or finger—a modification of Common's open guard—introduced in 1852, was the most important step ever taken towards the accomplishment of machine-mowing, and it was only by working on this American inventor's lines that the problem was ultimately solved.

Flexibility of the cutting apparatus is another requirement of the mowing-machine not shared by the reaper, a requirement which has resulted in giving to the mower an independent gear frame, supported on two driving wheels, from which frame the cutter bar hangs in such a manner as to follow freely all the superficial inequalities of the ground.

Although the development of the reaper and mower have progressed together, it is interesting to notice that the former,

having to deliver as well as cut the grain, is still an improvable machine, while the latter was practically perfected a good many years ago.

Haymaking-machines.—The first attempt at mechanical haymaking was made by Robert Salmon, who, in 1814, patented a hay-tosser which did not differ in essentials from the haymaker of the present day. It is only within the last twenty years, however, that the hay-fork has been generally abandoned; but the introduction of the mowing-machine has made the tedder a necessity, the farmer being unable to command labour enough to follow the mower, and unwilling, if he could get men, to let them lie idle in the event of his operations being stopped by wet weather.

The valuable constituents of grass consist chiefly of mucilage and sugar, which are not only soluble, but liable to ferment in the presence of water, and the object of haymaking is to retain these substances in the greatest possible integrity by depriving the grass of moisture. This can be effected perfectly only by the action of artificial heat, whose use is economically impossible in haymaking. The simpler process of sun-drying has therefore to be resorted to, and that system of hay tossing is the best which most facilitates the evaporation of water from the cut grass.

The haymaking-machine only simulates the action of a hay-fork, but its rapidly revolving teeth throw the swathe higher into the air, separate it much more thoroughly, and lay it much more lightly on the ground than can be done by manual labour. Hence its greater efficiency in assisting the process of sun-drying, while it is also indirectly valuable by economising time and thus lessening the chance of damage from change of weather. The haymaker has suffered no change in principle since its earliest introduction. It is only in matters of detail that the most eminent makers have effected any substantial improvements in this class of implement.

Horse-rakes.—Just as the mowing-machine postulates the haymaker, so the haymaker demands the horse-rake, for manual labour would fail the farmer if he attempted to follow these implements with the hand and drag rake.

Grant in 1841, Garrett in 1842, and Ransome in 1843, were the earliest patentees and makers of horse-rakes, but, as in the case of the tedder, it is only during the last twenty years that they have come into general use. There is, however, no field implement which has been more improved in construction during that time than the horse-rake.

Formerly only a rude adaptation of the hand-rake to horse

power, its modern examples are provided with steel teeth whose form has been carefully designed to collect large loads while giving a loose, light discharge. These teeth are, further, made adjustable so as to lightly skim or closely rake the ground at will. By the adoption of a balanced rocking frame, locked when at work, and free when being raised, the effort required for lifting the rake teeth has been reduced to a minimum, while the delivery can be made automatic at the pleasure of the driver.

Stacking-machines are now almost universally employed in rick-making, and consist of an elevator having endless chains furnished with carrying forks placed at intervals of a few feet apart, and driven by a pony or horse gear. The stacker rises from a four-wheeled carriage provided with a large hopper, into which the hay or sheaves are thrown from off the harvest waggon, and whence they are carried to the top of the stack by the action of the endless chains, the elevator itself being raised, like a fire escape, as the rick grows in height.

Hay and straw compressors are modern machines which, while as yet finding their chief use in the compression of hay and straw for the sake of cheapening transport, will probably be hereafter recognised as more valuable storing agents than the hay stack or straw rick.

The "Dederick Perpetual Power Press," shown for the first time in England in 1881, is an American invention consisting of, first, a rectangular compression chamber into which the hay is forced against the predetermined resistance of a sliding end plate; and, second, of a reciprocating hay-piston, playing into the mouth of this chamber. Rectangular bales of any convenient length are formed in this press, and are very handy, whether for stowage or transport. The Dederick machine can compress a ton of hay into a ton of measurement.

Hay, it may be remarked, always comes to market in the Middle and Western states of America in a compressed form, partly because the dry climate allows of the crop being pressed almost as soon as it is cut, but chiefly because the Yankee farmer has a very keen eye for such economical advantages as the baling system presents, whether for storing or transport, over that of stacking and trussing.

The "Pilter" power press, shown for the first time at Paris in 1878, consists of a cylinder into which hay is forced after having been twisted into bands by the action of two conical rollers. The end of the cylinder opposite these rollers is closed by a plate which resists the exit of the hay with a pressure proportioned to the density required in the bale, and against

this pressure the banded hay issues like a sausage from a sausage-machine. When a yard of the compressed material protrudes, the machine is stopped and the bale wired. Each bale weighs two hundredweight, and its density can be made to vary from 12 to 25 lb. per cubic foot.

A number of excellent hand-power hay-presses are now made in this country, notably by Barford and Perkins, which are more useful for the purposes of the tenant farmer than larger machines. A full description of these is given in the Report on the trials of hay and straw presses at Nottingham, which appeared in the Journal, Vol. XXIV., second series, 1888.

DAN. PIDGEON.

HORSE-BREEDING FOR PROFIT.

THE number of horses imported every year into this country (in 1890[1] the number was 19,286) has long caused the question to be asked, Why are not more horses produced at home? To those who, like myself, have lived all their lives in a horse-breeding district, where farmers breed horses for a profit with certainty, the reply that comes to their lips is, that farmers in many districts are wanting in enterprise and are not sufficiently alive to their own interests. But the agriculturist is hardly to be blamed because he hesitates before trying his hand at an experiment which, if it fails, is a costly one, or because he prefers to stick to those branches of his industry which he understands. I shall endeavour to show why the breeding of horses in my own district of Cleveland, and in the North Riding of Yorkshire, pays so well, also what classes of horses promise a safe and sure pecuniary reward to the British farmer, in the hope of assisting those who have for years been doing so much to encourage the cultivation of the various breeds of horses at home.

I should premise that I do not propose in this paper to dwell on the breeding of the most fashionable pedigree stock of any breeds; these fine specimens of Stud Book breeds have their markets, and command enormous prices, but their successful production will be always more or less limited to large or wealthy breeders. The possibility of commanding those fancy

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[1] The yearly average of imports for the five years 1866–70 was 1,785, value 45,369*l.*; for the five years, 1886–90, it was 13,458, value 238,699*l.*

prices that one sees quoted for pedigree Shire, Clydesdale, Suffolk, Hackney, Cleveland, and other horses must depend on a long association with the breed, success in the show ring, and a large outlay. My desire is to regard the subject from the point of view of the cultivator of 100 to 300 acres,—from the point of view of men in a similar position to the Yorkshire farmers, who have made horse-breeding pay from time immemorial.

In horse-breeding counties, such as Yorkshire, Durham, Cumberland, Lincoln, Norfolk, and Devon, the breeder has an advantage such as is derived from an old-established industry over the comparatively isolated breeders of other counties. Horse dealers live in his district, the London and foreign buyer visits the fairs and the farms, whilst elsewhere the difficulty of finding the ready purchaser at the right time is the most serious obstacle that the breeder has to contend with. This fact, and the fear of incurring the risk of losses, which, if they occur, are from the value of the stock very heavy, as well as a general idea that young horses require great attention and are somewhat mischievous in their habits, are the chief discouragements that militate against more extensive enterprise in breeding. But these considerations, even when allowed the fullest weight, ought not to deter the farmer from pursuing what under favourable conditions must be, over a course of years, a most profitable pursuit.

No doubt the innate passion for horseflesh in Yorkshiremen has had a good deal to do with their success in producing marketable horses; but, after all, the desire to make money is so strong a force that, if horse-breeding could be clearly shown to be lucrative, the British farmer would soon be induced to attempt it, and in the attempt it would be found that the keen interest in horses that would spring up would be equal in many other parts of England to that which exists in the counties I have just named.

Before a farmer begins as a breeder, he ought to satisfy himself as to (1) the class of horse for which there is the most continuous demand; (2) what horses, on the average, command the best prices; (3) whether any of the breeds that it would evidently pay best to raise could be bred from animals that earned their livelihood in work on the farm. If the last condition is fulfilled the certainty of profit is assured. How do the various classes of horses with which we are acquainted suit themselves to these three conditions? Let us take the cart-horse, which naturally claims the first consideration.

The breeding of good sound cart-stock should pay, and pay

well, for the demand is universal and continuous. The farmer who has young cart-stock to sell can always find a customer. If the horse is a big heavy one that will "pull," the railway companies, the brewers, millers, and carriers will buy greedily, and the possessor of such a horse can command a price of from 65*l*. to 100*l*. If the horse does not quite come up to the big standard, there are plenty of customers at a price of from 45*l*. to 60*l*.

With either of these horses there is a large margin of profit: the horse should not cost the farmer more than 25*l*. at most to rear, for at two years old he should be able to begin to contribute to his own living. His dam, of course, must be a sound, active, willing mare, clear of side-bone and hereditary unsoundness, and she would do her full work practically up to the day of foaling, only being kept clear of the shafts and heavy loads for a month or two previous to that event. A man who had a pair of such mares, and took care to mate them with sound active Shire stallions, would be as sure of a profit as it is possible for a man to be of anything. Half, and more than half, the want of success in all departments of horse-breeding is the lack of enterprise in selecting the sire. Nothing is so foolish, so wasteful, and so extravagant as the attempt to save 10*s*. or 1*l*. by choosing an inferior sire at a lower fee. Yet how often we see it done, and the sound, hard, wear-and-tear stallion with a known reputation is given the "go by" for the first cheap horse that passes the farm. If you find a horse that "nicks" well with your mare, and know that his stock is sound, active, and enduring, it is worth while going to both expense and trouble in order to secure his services. For the possession of a reputation for breeding enduring, sound, and active cart-horses carries with it the command of the top price in the market. In the North Riding there is always a good demand for little, "stiff," wide cart-horses for the mines, so that should a man possess an undersized one he can often get as good a price as he could were it several inches higher at the shoulder.

There is a breed which is not popular in the north, and of which I know nothing from practical experience—the Suffolk—which, if they were as good as they have often appeared to me to be in show rings, I cannot help thinking would be invaluable to the farmer horse-breeder. If their tendency to bad feet could be bred out, I feel convinced that a well-made, active, Suffolk mare would, whilst earning her own livelihood on the farm, be able to produce good half-bred stock, and perhaps fine harness-horses, if crossed with the Yorkshire Coach-horse or certain big Hackneys, as their uniformity of type and colour and their hairless legs eminently fit them for this purpose. Of the

Cleveland mare, which I regard as the ideal type of farmer's brood-mare, I shall have something to say later on.

Blood-stock may be eliminated from serious consideration as an appanage of the farm. Like everything else connected with the turf, there is too much dependent on fortune, and should a farmer with a thoroughbred mare have the enterprise to send her to the most fashionable blood, and to pay the enormous fee that such sires command, it cannot be wisdom for him to run the risk of the great loss that a barren mare or an indifferent foal must be to him. *Hunters*, however, may be worth his attention if he lives in a hunting country and hunts himself, or has a son that can ride a horse to sell. I know plenty of small farmers who make it pay, but I do not think it is the most safe or lucrative form of breeding on a farm. At the same time hunters never fetched a higher price than they do now if they know their work, and, as the Hon. George E. Lascelles points out in his paper on "Half-Bred Horses for Field or Road," as men of every size and weight join in the sport, no matter what the size of the horse there is always a market for him. Besides this, the possession of a hunter promises the farmer the prospect of combining pleasure and profit.

The uncertainties and risks in breeding hunters are very considerable, and it is impossible when you have bred one "clipper" to count on getting even off the same mare by the same sire another equally, or even approximately, as good. I have had off the same dam (a well-bred strong mare, and the cleverest I ever had) two consecutive foals, the first by Lord Zetland's *Morocco*, that reached 16 hands 3 inches at four years old, and the next by *Laureate* (by *Rosicrucian*) which only got to 14 hands 2 inches at four years old. They were both very good, but I sold them, as one was too big and the other too small for me. Of one thing there is no doubt, that to breed hunters successfully it is necessary to keep clear of carting-blood, and you must not be afraid of keeping your horses till they are five years old if you wish to sell them well. Really big blood hunters take six years to get properly furnished and conditioned, and the difference between the same horse at four and at six or even seven years old is often astonishing. In Cleveland very few hunters remain in the farmers' hands after four years of age; but many that are sold for a little money at that age, or at three years, fetch a very long price a year or two after. Perhaps the ideal weight carrier is the second thoroughbred cross off an active Cleveland mare. One of the hardest fifteen-stone men I know told me quite lately the best hunter and stayer he ever had was out of a Cleveland mare by *Hollyfox*.

Owing to the scarcity of Cleveland mares, and the demand for the pure stock, this cross is comparatively rare, and from my own experience I should say the average Yorkshire hunter is as a rule slightly inferior to the Irish.

There is little doubt that the qualities of endurance in the Irish hunter are due in no small degree to the fact that their good sires are horses that have been tried themselves, and have been raced and hardened with severe work. It is notorious that some of the most successful Irish sires have been regular slaves, and in some instances have been driven to a race meeting, taken out, and after running and winning, trotted home ten Irish miles with a car laden with the rejoicing family and friends of the owner! A hunting brood-mare should be a good huntress, able to gallop and stay all day, not old, with constitution, limbs, and quality, her height about sixteen hands, and well timbered below the knee. If such a mare is carefully mated and her foal done well to, there will seldom be disappointment.

Yet, after all, it is in my humble judgment the harness horse that can be bred with the minimum of risk and a certainty of profit. The conditions laid down at the commencement of this paper are here best fulfilled; but before attempting to demonstrate this it is worth while, in passing, to allude to Cleveland Bays—the breed that has formed the foundation of the reputation of Yorkshire breeds. It is needless to point out that the breeding of pure Clevelands is profitable, when it is well known that even colt foals at foot are bought up annually throughout Cleveland for the American and foreign market at prices varying from 30*l.* to 60*l.* apiece; but it is worth while to consider why the Americans ransack this country for them. It is notorious that the horses we import by thousands are carriage horses from Germany, America, and Normandy, and we have supplied these countries with the sires and often the mares that enable them to fill the London dealers' yards with high-priced carriage horses. I made a careful inspection of the classes of Karrossiers at the great show at Berlin in 1889, and found that the Cleveland had given them their superb Oldenburg and other breeds. There is one family in Cleveland who for fifty years have exported every mare of the Cleveland breed they have bred to one farm in Holland. The Cleveland's value to the breeder over all other breeds is that it can be absolutely relied on for transmitting its beautiful and distinctive characteristics to its progeny, and above all, its uniformity of *colour* and *type*, elements of the greatest importance in breeding carriage-horses. Here are some American opinions:—

Chas. A. Snyder, a breeder in Illinois, says:—

In regard to the Cleveland Bay, I think they are the best horses in America to-day.

Speaking of a sire he says:—

I guarantee a man a bay colt or no pay, I don't care what the colour of the dam is. They are the finest dispositioned horses there are in the world; they are the most uniform breeders, and best general purpose horse in America.

Messrs. A. & J. Derwent, in the same State, declare them the best breed of any they have ever raised; in three years they had by their Cleveland sire but one colt not bay, and he was off a white mare.

The greatest trouble is that we cannot keep our colts until they mature; buyers won't let us. They are taking the lead of any other breed here with us.

Ed. Rodgers, Upper Alton, Ill., states:—

There is great uniformity in the get of my Cleveland horse: can pick out every colt of his amongst other breeds . . . the past season had good bay colts from grey and sorrel mares.

F. Hand, Pontiac, Ill., writes:—

The Cleveland Bay horse I bought from you has proved himself to be a first-class breeder, both as to style, colour, and form; also a very sure foal getter. We have had mares of all colours, but he colours all of his colts bay or brown.

John W. Sanner, Prairie Home, Ill., writes:—

My opinion of the Cleveland Bay is very exalted, and I can base same on well-founded grounds, from the fact that I have made this branch of the horse family a special study for the last three years, and the more I learn of the Cleveland Bay, the better I like him. As a general and special purpose animal, he stands to-day without an equal—a general purpose horse, because he is adapted to all kind of work, from the road to the plough. No horse exists, in my opinion, that has as much strength to the weight of the animal as the Royal Bay, and when this is said it covers a great deal of ground, when we think of how many different kinds of horses there are—a special purpose horse, because their uniformity of breeding is such a *marked characteristic*, there being no trouble to find matched teams where the bays are bred to any extent. Different styled mares will bring colts from a Cleveland Bay that look so much alike that a casual observer cannot tell one from another. As regards colour, my experience has been very gratifying indeed; in several instances where mares have been black, grey, sorrel, white, and dun, the colts have all been good bays. My further opinion is, the Cleveland Bay is the best horse on earth.

Mr. George A. Wiley, California, writes:—

We have a lot of colts from *Duke of Wenlock* out of all kinds of mares —native, half Norman and mustangs—and there is not a poor colt in the entire lot. For size, colour, symmetrical form, beauty, style, and finish, I never saw their equal. The mares we bred last season were mostly half

Normans and grey in colour, and all the colts have turned out bays. This convinces me that they breed wonderfully true to colour. As far as our experience goes, we are more than pleased with the results so far, and consider the breed the best general purpose or coach-horse that can be raised, and the most profitable for a farmer to raise. The farmers in this vicinity are very much taken with them.

The above American opinions, with many others almost identical in expression, have been kindly furnished me by Mr. Frank Stericker, of Pickering, Yorks; his firm of Stericker Brothers, in Illinois, have imported Clevelands largely into that State, and I have a list of sixty-six Cleveland stallions standing at their stud farm.

Before leaving the Cleveland I would state it as my deliberate and confident opinion that the farmer who has two good Cleveland mares cannot fail in breeding the highest class of carriage-horse at a large profit. A draught of Cleveland mares will kill a pair of any other agricultural horses if matched against them by the day or the year (though it may require a North Country ploughman to walk after them), for as Mr. John W. Sanner, quoted above, says: "No horse exists that has as much strength to the weight of the animal as the Royal Bay." The sire that must be used for such mares should have blood, quality, and action, be he Thoroughbred, Hackney, or Coach-horse.

Carriage-horses from Yorkshire, as was proved before the Lords' Committee on Horses, presided over by Lord Rosebery, in 1873, command a higher price than the Norfolk and others, as the Norfolk breeder was careless whether he bred from a black with white legs, a grey, a chestnut, or a roan, whilst the Yorkshire horse was almost invariably a *bay* or *brown*. There are on the side of the Cleveland brood-mare power, activity, substance, good action, hardihood, and a certain amount of quality.

Let us inquire into the *demand* for the carriage-horse.

Before the Royal Commission on Horse-breeding (1873) all witnesses were unanimous in deploring the scarcity of Yorkshire horses. The dealers in London and the middlemen all described their inability—at any price—any longer to obtain these in Yorkshire, and the way in which year by year they had gone further afield—to Germany, to France, to Ireland, and to America—to supply the demand. Since then there has been a revival of horse-breeding at home, as the figures for the export of homebred horses show :—

	No. of Horses exported	Value £	Average Price £	s.	d.
1879	5,018	295,052	58	16	0
1889	14,266	984,611	69	0	4
1890	12,916	687,978	53	5	4

But these horses which we have exported have been Thoroughbred stock, Hackney, Coaching, Cleveland, Shire stallions and mares, and also a few hunters, whilst the general carriage-horse we have had to import by thousands, after furnishing the foreigner with our stallions and mares to supply our demand.

Leaving out Ireland, whence a large proportion of the carriage-horses are drawn, we imported, in 1890, 19,286 horses, of which 12,600 were from Germany, 2,486 were from Denmark, and 1,575 from Holland.

Every dealer, every job-master, every gentleman who drives a pair of carriage-horses, is in a constant condition of looking out for good horses and match pairs, and the lucky possessor of the right article can almost name his own price.

In 1890 our import of 19,286 horses from abroad was valued at 335,906*l.* Why should not this money go into the pockets of the English farmer? It is his own fault that it does not.

I have taken the trouble to find out how the great London job-masters managed to find carriage-horses, as for their business they must have really good, sound, and enduring ones, and what were the prices they paid. Here are the figures given me by four of the best and largest job-masters. I am precluded from giving their names without their sanction, and therefore will call them A, B, C, D.

A. & Co. say:—

As to the proportion of carriage-horses that are purchased abroad and in Great Britain, we think about a third may be English and Irish—Irish much preponderating in number over English; we should think the remaining two-thirds come from abroad. The price is about the same everywhere—four- and five-year-olds from 100*l.* to 150*l.* each, average price very nearly 100*l.*

B. & Co. say:—

We have our agents in Ireland, in Yorkshire, Norfolk, North Britain, and Devon and Cornwall, who keep us supplied with the colts we buy. All are unbroken, mostly three years old. The average price 100*l.* to 120*l.*, according to size and quality. Some seven years ago we imported a good few Americans, but they did not quite do, and the price was about the same at home as our own horses.

Nearly all the "dealers'" horses are foreign, from all countries, but what their selling value here in London is, compared with ours, we cannot say. Many fetch very high figures, but they are not job-masters' horses—for our purpose they must be able to work and wear.

C. says:—

No foreign horses—50 per cent. of his are English, 40 per cent. Irish, and 10 per cent. American—and the average price for four-year-old colts, 75*l.* in Ireland and England, and 65*l.* for Americans in America.

D. & Co. say,—and their opinion is most valuable, as they have made this question one of particular attention,—

Of our horses:

30 per cent. are English	3·6 per cent. are German
15 „ „ Irish	·15 „ „ Belgian and Dutch
8·5 „ „ English or Irish	·6 „ „ French
33·45 „ „ American	8·7 „ „ Various

Of the horses bought by our firm in 1889—

37·26 per cent. were English	1·24 per cent. were German
28 „ „ Irish	0 „ „ Belgian or Dutch
8·7 „ „ English or Irish	·6 „ „ French
9 „ „ American	14·10 „ „ Various

We find we cannot buy in the trade horses to suit our business, except occasionally under exceptional circumstances, at less than 95*l.* to 125*l.* apiece. Four-year-old carriage-horses were very scarce in Ireland in the Autumn of 1889, and cost us 90*l.* to 125*l.* each. American horses are very expensive at present, on account of the risk of the voyage; but they make most excellent carriage-horses, and when they come into our hands are generally five or six years old. We have found them of great service in our business, and like them very much indeed. German horses are quite as expensive as English, Irish, or American, if bought fresh and new, on account of their showy appearance, but we consider them useless to put to work on account of their well-known want of stamina, courage, and soundness. There are, however, an immense number of them in the dealers' stables iu London. We have a few Norman or French horses in stock, and our experience of them is not so favourable as it is of English, Irish, or American horses, but they are certainly better than the Germans.

Personally, I must say I thoroughly dislike foreign horses, with the exception of Americans, and much as I like a good English and an Irish hunter I am firmly of opinion that, as carriage-horses, Americans are superior to our English and Irish horses. I believe this to be due to the fact that for generations the carriage-horse in the States has been a distinct race, and has never been spoiled by the mixture of any cart-blood. The best English or Irish carriage-horse may have been descended, and most likely on the dam's side, from cart-stock, and perhaps no further back than the second generation. And although the sire may have been a Thoroughbred horse, yet the cart-blood is sure to come out sooner or later, most probably in the gradual loss of courage and energy in constant work.

I have had exceptional opportunities of comparing and studying the American horses, and I have been six or seven times in the States, and we must have had at least 500 or 600 of them in our business during the last ten years.

I am therefore justified in coming to the conclusion that there is a demand, that it is continuous, and that the price is a very high one for the best class, and a most remunerative one for all honest, sound, hard carriage-horses. How then are we to produce this type of animal? There are some who think it can be bred from cart-mares, but all the buyers, dealers, breeders,

and workers of harness-horses, who know most about it, say emphatically *No*! and I thoroughly agree with them. There are, of course, exceptions to every rule, and it may occur, with good luck, and where the cart-mare has action, courage, and endurance, that such a mare may throw some useful and showy stock. But the risk in mating the two extremes, viz. the thoroughbred with the cart horse, or *vice versâ*, seems to be that you get instead of a combination of the substance, and perhaps action, of the cart-mare with the quality and courage of the Thoroughbred, either an animal all common or all light—either quality and no action, or no quality and good action, a common top and light bone, and nine times out of ten an animal that is a slug, without courage and without "bottom." Authorities are good and numerons on this point, and in addition to one I have quoted above, I might mention a very competent one. Mr. Burdett-Coutts, M.P., who is a large breeder, and a most keen observer, and who has studied the question in England and abroad, speaks, in one article, of a fact which many of us have tried hard enough for a long time to impress upon horse-breeders in this country, viz.:—that the acme of harness-horse breeding is not to be found in the cross between a Thoroughbred stallion and a cart-mare. And again he declares we want size, for the foreign market especially, but we must have it without cart-blood.

For myself, I have never seen a carriage-horse, possessing this cross of cart-blood, that had an outline which could be compared for a moment with that of the Cleveland, or with that offshoot of the Cleveland—the Yorkshire Coach-horse. The elegant crest, the beautiful curves carried back over the withers along the fine top line of the back to the lengthy level quarter and the high-set tail, these cannot be found in the progeny of a cart-horse or a cart-mare. They will have a common top line—most probably a coarse short quarter, and, as in the Hackney breed, the tail set low.

Now, there appear to me to be three ways in which a breeder can make half-bred horse-breeding successful and very profitable. Let the farmer provide himself, if he is without them, at the first decent opportunity, with two well-timbered mares of the strong Cleveland Bay type. If they are pure bred he can always use them when the demand is great for breeding pure Cleveland stock. Their purity adds to their value in the market and in insuring uniformity in their produce. Let them be strong mares, on short legs, with good action, always remembering that *action is beauty, pace, and money*. Let them above all things be sound and hardy, fit to do their full share of farm

work, and thereby alone more than pay for their keep. With mares like this he must succeed, for—

(i.) If he uses a sound *Thoroughbred* stallion, *with action*, he will get one of three things:—

(1) A grand carriage-horse.
(2) A valuable hunter.
(3) At worst a trooper.

(ii.) If he uses a "*stepping*" *Hackney* stallion, provided he has quality and *size* enough, he will get—

A very excellent carriage-horse, with high action, but generally slightly inferior in outline, as he runs the risk of getting the short Hackney quarter, low-set tail, and short neck.

(iii.) If he uses a high-quality Coaching stallion with action, he may turn out the most magnificent match pairs of bays.

If I allowed myself to put aside the question of the utility of the brood-mare on the farm, I should say to breed the ideal carriage-horse take a Yorkshire coaching mare of the elegant stamp of *Candidate's* "get" and use a sire as near Mr. Burdett-Coutts's *Sultan* in shape and action as possible.[1]

No doubt there are other ways of breeding carriage-horses. There is the plan of putting big Hackney stallions to Thoroughbred mares, but this and similar methods are hardly suitable to the farm. However, I may quote what the Earl of Charlemont (who was at the time perhaps the greatest horse-breeder in Ireland) said in 1873 before the Lords' Committee on Horses, viz.: that all breeds paid him except Thoroughbreds. But "harness-horses paid him better than any other." He had bred his best by a Norfolk trotter *Broad Arrow*, off hunter mares; adding, "I am very particular as to the quality of my mares." *Broad Arrow* was a common looking but hard and very active horse. When asked how he was bred, Lord Charlemont said, "I never asked about his pedigree, because my theory of breeding is to judge by the stock a horse produces."

Before leaving the half-bred, I would say a word about army remounts. For these there is always a home and a foreign demand, but the profit to the breeder is not a tempting one, for the prices run about 40*l.* for four-year-olds and the French prices about 45*l.* If the Government want good sound troopers, fit to carry 17 to 20 stones, they must give considerably more money for them, as at present prices there is an exceedingly small margin for the farmer when the risks of barren mares and

[1] *i.e.*—breed Yorkshire Coach Horses.

accidents are estimated. The best army horses would be produced by—

(1) Putting a strong half-bred mare to a big roadster or short-legged Cleveland.

(2) Or by putting a clean-legged active cart-mare about 15·2 to the Thoroughbred, or, adopting the late Mr. Nalton of Copmanthorpe's words, "the neat cleanly vigorous cart-mare to the Thoroughbred sire."

One word as to *Hackneys.* They are at present in fashion at home and abroad. The prices for Hackneys, above 15·2, that are really good, are extraordinary. But, though the price for a tip-top Hackney is a high one, I doubt if the average price obtainable over a series of years is a very remunerative one. The Hackney is a good crossing basis. Hunters can be bred off Hackney mares, and Hackney stallions can get, as we have observed, carriage-horses. For *Hacks*, both "ladies'" and "gentlemen's," there is always a capital market, and a fancy price—with a most important reservation, viz.: provided perfect mouths, paces, and manners are combined with absolute soundness and good looks, all of which qualities the most careful and fortunate breeder cannot count on distinguishing his young stock.

Ponies, where they can be bred on the edge of moors and on hillsides, should be profitable enough in a district where pit ponies of the Shetland and small breeds fetch good prices, and good blood ponies fetch the prices of good horses for polo and driving purposes.

One point with regard to young stock it is necessary to emphasise, and that is the importance of doing the best you can for foals between the time when they are taken from their dams and the following summer. This is the hardest period in the colt's existence, and to start him well as a yearling is half the battle.

The question is often put, What is the actual cost to a farmer of a broken colt at four years old? My own idea is that, breeding from mares earning their living, a four-year-old should not cost more than 35*l*. In the case of mares there is no harm done in putting them to the horse at two years old, so as to foal the middle of the May following, and leaving them unbroken till they are nearly four; so that if mares do not quite fetch the price of geldings they do not cost so much to rear. Mr. Thomas Petch, a Cleveland breeder, estimates a three-year-old colt to cost, one year with another, nearly 30*l*.

Mr. Thomas Boyes Jackson, of Holderness, a witness before the Royal Commission in 1890, says: "The cost to the breeder to rear a four-year-old, after reckoning for the breaking, is about

80*l.* (from an idle mare). In the case of a four-year-old colt out of a general utility mare it would be 40*l.*"

Mr. Andrew Brown says, "It costs 40*l.* to rear a four-year-old colt, and if a farmer got that price for good and bad, it would pay him better than rearing cattle."

In conclusion, I would say that could the Chancellor of the Exchequer augment, by another 5,000*l.*, the 5,000*l.* a year already at the disposal of the Royal Commission on Horse Breeding, and could the Commissioners allocate some portion of this money to the encouragement of sound agricultural and other than Thoroughbred sires, I believe that the impetus already given during the last few years by Queen's Premiums to horse-breeding would be so much greater as to astonish us all in its results. And further, if Mr. Chaplin could be induced to initiate a system of Government certificates for stallions that would give the ordinary breeder protection against unsound sires, I believe an incalculable amount of good would result.

A. E. Pease.

THE LIFE OF THE WHEAT PLANT FROM SEED TO SEED.

As the Royal Agricultural Society has decided to publish a series of eight coloured diagrams of the wheat plant, it has been thought that it might be advantageous to give in the pages of the Journal, for general information, a description of the life of the wheat plant from seed to seed. No more careful study nor faithful representations of wheat have ever been made than those of Francis Bauer, and the diagrams in question (which are given in miniature on pages 92 to 99), are reproductions of his original drawings, now in the Botanical Department of the British Museum.

I. The Structure of the Grain.

(The figures printed in the margin refer to the corresponding figures on page 92.)

The seed of a plant resembles the egg of a fowl. Each contains a living germ with a supply of food, surrounded by a protective covering. Under suitable conditions the living germ starts into active life, and finds in the store of food sufficient to meet its early need and carry it on until it can obtain food for itself—that is, in the one case, until the roots of the plant have got possession of the soil and the leaves are spread into the air, and in the other until the chicken is sufficiently grown that, having escaped from its shelly covering, it can seek food for itself.

The grain of wheat is oval shaped, with a deep furrow on
the one side, and an oblong wrinkled depression towards the 1
base of the other side, below which is the scar of the attachment
to the stalk on which the grain was borne. The top of the
grain is covered with a number of fine hairs. If the grain is 2
steeped for a few hours in water, it is easy, with a needle or a
fine knife, to lay back the skin over the wrinkled depression.
The minute plant or embryo is then exposed, and is seen to be a
double cone, terminating below in the first root, and above in
the first leaf. The two roundish coloured swellings on either
side of the primary root are the first pair of secondary roots.
When with a razor or sharp knife we cut a grain longitudinally 3
along the line of the furrow, the knife passes through the middle
of the little plant. The first root is seen to be protected by a
little covering, and a similar envelope encloses the first leaf.
Within this leaf we can already see one or two more leaves
crowning the minute stem. A slightly coloured organ, developed
from the inner side of the little plant, separates it from the
main body of the grain; this is called the *scutellum.* It is
the medium of communication between the plant and its supply
of food—the mass of hard white material which forms the bulk
of the grain. A transverse section through the thickest part of 4
the grain does not touch the embryo, but exhibits only the
store of white food. A little lower down we cut across the first 5
leaf enclosed in its protecting sheath, and the scutellum, whose
outer surface is applied to the store of food. Still lower down 6
we get a section of the roots and of the lower part of the scutellum.
With a little care the embryo can be removed from the
rest of the seed, and its form can be seen. This little plant has
a delicate structure; the contents of the cells are in a fluid condition
and it easily dries up. The miller describes the embryo
as "yellow, moist and oily." The wrinkling on the surface of
the grain is caused by the drying of the underlying embryo.

When a thin section of the store of food is magnified, it is 7
seen to be made up of an immense number of many-sided cells.
The cells are filled with starch in the form of minute granules 8
of different size. The substance of the walls of the cell has
the same chemical composition as the starch, being built up of
the elements of water (oxygen and hydrogen) combined with
carbon. The smaller granules in the outer series of cells are
more complex in their structure, containing nitrogen in addition
to the elements forming starch. Similar granules are
mixed with the starch in the body of the seed. These are the
gluten of wheat.

The two layers which form the protective covering of the
grain do not properly belong to the seed. They really repre-

sent the fruit enclosing the seed. The covering proper to the
9 seed is very delicate, and is represented by the white space between the skin and the seed itself. The skin which represents the fruit or pistil (and the presence of which has led us to speak of the *grain* and not the *seed*) is composed of two layers, the
10 outer being formed of larger and thicker-walled cells. Greater strength and elasticity is secured to the skin by the length of the cells of the one layer being at right angles to the length of the cells in the other. The swelling of the grain consequently does not rupture the skin.

The food stored up in the seed for the use of the embryo, like that stored in the egg, is taken and used as food by man. The miller grinds the grain into flour. In ordinary mills the grain is ground between the millstones, and thereafter the skin or bran is separated by a series of siftings from the white flour. In the new roller mills the quality of the flour is greatly improved by the separation of the bran and the slightly coloured embryo, before the store of white food is converted into flour.

The grains of wheat which contain the largest proportion of gluten are the most valuable for animal food. Starch alone cannot build up the muscle of animals. Flesh requires for its formation nitrogen in addition to the elements found in starch, and this is to be found in the gluten of wheat. Grains of wheat rich in gluten are translucent, and horny in section, while those in which it is deficient are opaque and dull white. These two qualities of grain have different economic values,—the one rich in gluten is best for making bread, the other abounding in starch is most valuable for malting.

II. Germination of the Grain.

(*The figures printed in the margin refer to the corresponding figures on page* 93.)

When wheat is stored, the little plant in the seed remains dormant. It is not, however, free from the influence of external conditions. It parts with its moisture to the dry air, and this may go on till the plantlet is completely dried up and killed. A few years are sufficient to produce this change in a grain of wheat. Every well-ripened wheat seed may grow when sown the year after it has been harvested. But if seeds be kept for two years some will fail to germinate, and the number failing will increase year by year, till in six or eight years not a seed will grow. The stories of the germination of wheat that has been buried with mummies are only fables. The most vigorous and prolific crops are grown from fresh ripe seeds.

Under the influence of warmth and moisture the plantlet

in the seed begins its independent life. A seed of wheat will not grow unless the temperature is 10° above freezing, while a heat of 104° Fahr. kills it. It germinates most vigorously at a temperature of about 80° Fahr.

Supplied with moisture and a suitable temperature, the seed begins to swell and soften. In the field the seed gets its moisture from the soil; when sown, it should not be placed too deep in the ground, but should be covered just sufficiently to keep it moist. The cells of the plantlet contain the living *protoplasm*, which is chemically a nitrogenous substance like the stored-up gluten; in the plantlet it is in a condition of rest, but is capable of resuming activity under favourable circumstances. Every active cell in a plant is either filled with protoplasm or its walls are lined with it. By its agency all the work of the plant is carried on: the elements of the food are taken in through root and leaf, are manufactured into organised substances, are transmitted to where they are needed, and are there built up into the tissues of the plant by protoplasm. The starch and other carbohydrates in the seed supply the material for the formation of new cell walls, while the nitrogenous gluten serves to make good
the waste and to increase the bulk of the protoplasm. The new life 1
manifests itself by the growth of the minute plant, which soon bursts through the skin, first sending down its rootlet and then pushing upwards its stem. The whole plantlet escapes from the seed except the scutellum, which remains attached to the
store of food. 2

A longitudinal section of the seed shows that at this early stage of growth a change is taking place in that portion of the food store which is next to the plant. With the first manifestation of active life, the cells on the surface of the scutellum which is applied to the store of food begin to give out digestive fluids; one seizes upon and dissolves the walls of the cells; another, called *diastase* (the same in nature and action as the diastase of the saliva), acts on the starch grains contained in the cells, and changes them into grape sugar (*glucose*); and a third, a peptonising fluid (agreeing in its nature and action with trypsine, one of the digestive secretions in the alimentary canal), dissolves the gluten grains. The food thus prepared is absorbed by the scutellum and transmitted through it to the plant, where it is used by the protoplasm to build up the growing tissues. In a day or two the rootlets burst through their protecting sheaths, and push their way through the soil in search of water, which it is their main function to secure for the plant.

In the preparation of malt, the germination of the seed is allowed to proceed to this stage. The diastase from the

scutellum has modified some of the starch, and in the further process of mashing the bruised malt, the work begun in the germinating grain is completed, and the whole of the starch is converted into grape sugar. The maltster kills the germinating seed by raising the temperature of his kiln above 104° Fahr. The young plant, dried up and rubbed off, is known as cornings or malt dust.

5 In another three days the roots have actively extended
6 themselves, and have developed a number of fine hairs, which
supply a large surface for taking in the needed water. There
10 are no openings in the roots for the entrance of water; it is
taken in through the walls of the root hairs. Dissolved in it the wheat-plant secures some mineral and other substances necessary for its food, such as compounds of nitrogen, potash, lime, magnesia, silica, iron, phosphorus, and sulphur. In his use of different mineral and other manures, the farmer supplies the necessary substances in which the field is deficient, or replaces those that have been removed by former crops.

6 The leaves are still covered by the protecting sheath, and
new ones are being formed at the growing point of the stem. A
7 transverse section shows the cell structure of the protecting
sheath, and the first green leaf folded up on itself. The leaf is
8 covered by a skin or *epidermis*, which encloses a mass of green
cells, penetrated by slender fibres (*vascular bundles*) passing up
9 the leaf, and forming the veins. These fibres (which are the leaf
skeleton) form the supporting framework for the cell tissue and also serve to transmit fluids. The epidermis is pierced by numerous two-lipped mouths (*stomates*) to permit the entrance of the air to the green cells, and the escape of water-vapour and the gases set free by the plant.

III. The Young Plant.

(*The figures prin'ed in the margin refer to the corresponding figures on page 94.*)

1 In twelve days or so after sowing, the first green leaf makes
2 its appearance. The little plant has grown about an inch high.
The point of the leaf pushes itself through the sheath and at
once begins to manufacture food on its own account, though
3 there still remains for its use a large stock of food in the seed.
The stomates which are seen in the unexpanded leaf admit the air to the green cells. Atmospheric air is a mixture of the two gases, oxygen and nitrogen, with some water and a small quantity of carbonic acid gas. This gas forms rather less than one part in every two thousand: it is the portion of the air which the plant requires for food, and it is the function of the leaf to obtain it. During sunlight the protoplasm in the green cells of the leaf is

actively laying hold of the molecules of carbonic acid gas, and breaking them up to obtain the necessary carbon. The oxygen which is not required is returned to the air, while the carbon is manufactured into starch by union with oxygen and hydrogen, which have been obtained as water from the soil.

When the plant has risen about four inches above the ground 4
the second leaf makes its appearance. A longitudinal section
of the plant at this time shows that a lateral bud has already 5
been formed, which will in due time develop into a stem bearing
its own ear of grain. The buds from which the secondary stems
in a wheat plant grow are formed at the base of the older leaves,
in the angle between the leaf and the stem. They are repetitions
of the main stem, except that it sent its roots into the ground,
while these are at first implanted on the original stem, though
afterwards they send out roots of their own. Nearly the whole
store of food has now been used up. The delicate cells at the
tip of the stem are adding fresh joints and forming new leaves.
After a few days a third leaf appears. The whole of the food 6
laid up by the parent has been utilised, and the plant has now
to manufacture all its food. The roots have increased in 8
number, and are beginning to branch. 7

The root increases in length by growing at its extremity. 9
This is a special adaptation to the conditions under which it has
to live. It has to push its way between the particles of the
soil. Having insinuated itself through the smallest opening,
it then easily pushes aside the particles of the soil as it grows
in thickness.

IV. Early Growth of the Ear.

(*The figures printed in the margin refer to the corresponding figures on page* 95.)

A longitudinal section of a young plant of wheat, with only 1
four leaves spread out, shows that all the joints that exist in the
straw of the full-grown plant are already formed, and that each 2
joint has its own proper leaf springing from it. Above the last
leaf the stem terminates in a small knob, which is the beginning
of the ear. A month later many additional stems have been 3
produced, and a corresponding development of the roots has
taken place. A transverse section of such a plant near the root
shows the original stem near the centre, and two or more se- 4
condary stems, each with still younger stems springing from
their bases. The production of stems beyond the primary one
is greatly helped by securing for each plant a fair space to grow
upon. This increase of stems from one seed, called tillering,
may proceed until as many as fifty or more are produced, each
with its head of grain. A longitudinal section shows the short 5

stems with all their joints close together except the lowest ones,
which are beginning to lengthen out. Up to this period of the
plant's life the stems are solid. Each stem terminates in a
6 growing ear, and that of the oldest stem shows the beginnings
of the different branches of the spike in a series of slight swell-
ings on the two sides of the axis. The examination of specimens
7 at intervals of a week discloses the formation of cushions or
8 rings on these growing processes, which about the middle of
May have become so definite that one can distinguish the scales
(*glumes*) and flowers of the spikelet.

V. Growth of the Ear and Flower.

(The figures printed in the margin refer to the corresponding figures on page 96.)

Towards the end of May the stem of the wheat has length-
ened considerably, carrying at its tip the growing spike. The
1 different parts can be clearly observed. The broad bases of the
2 scales with their awn are to be seen, and the anther cells have
pushed themselves above the scales. In the beginning of June
3 the swelling of the sheath of the last leaf tells of the presence
within it of the spike. If we remove the spike from the sheath
4 and examine with care a spikelet, we find that all the parts,
5 though small, are fully formed. After taking off the two empty
glumes at the base and pulling back the next glume, we find
within it a small flower, the most obvious parts of which are the
three stamens. Below the stamens are two thin fringed, white
scales (*lodicules*) which represent the gaily coloured part of the
flower of the lily. The surplus food which has been laid up by the
active plant supplies the constant demands of the growing spike.
The process of flowering is carried on entirely at the expense
of the food prepared in the green parts of the plant.

6 The growth of the spike is now rapid. In a week the flower
7 doubles its size, and by the time it emerges from the leaf sheath,
8 which is about the middle of June, the stamens have attained
their full growth and are ripe. They are three in number.
9 The large anthers are each composed of four long lobes or cells
10 attached to the thickened upper part of the filament or slender
stalk of the stamens. The cells are filled with a fine powder,
11 consisting of minute yellow balls, called pollen grains. The
stamens are essential parts of the flower, being the fertilising
organs, and the yellow powder is the fertilising matter. If we
draw aside the stamens, we find the ovary or young grain
enclosing the rudimentary seed, and surmounted by two feathery
styles, not yet fully developed.

VI. The Flower.

(*The figures printed in the margin refer to the corresponding figures on page 97.*)

Towards the end of June the flower is fully ripe. The 1
feathery styles have expanded, and the yellow stamens with 2
their now empty anther-cells have been pushed out beyond the
scales by the lengthening of their slender filaments. If we remove 3
one of the spikelets, and tear off the two lower glumes, we find
the flower immediately above enclosed between two scales, the 4
outer one thick and curved like the two that have been removed,
and the inner (the *pale*) very thin. Proceeding further to 5
remove the outer glume, and then the pale, we have remaining 6
the flower proper. This consists of the small fringed scales,
the three stamens, and the pistil with its two feathery 7
styles. The anthers burst along the line which divides each 8
of the two lobes of the anther into its two cells, and the
grains of pollen are discharged. Much of the fine powder is 10
carried away by the wind, but some of the fertilising granules 12
find a resting place on the hairs of the feathery style. These 15
hairs have the property of holding fast the pollen grains until
they begin to grow by pushing out thin pollen-tubes into the
interior of the hair, and on down through the style into the 13
cavity of the ovary, where they reach and fertilise the ovule. 14

When the wheat is in full bloom the active life of the plant as a manufacturer of food has reached its climax. The plant has attained its full size, all its leaves are spread out in the air, and the roots have gained their greatest dimensions in the soil. The flowering over, the leaves and roots begin to lose their food-producing energy. Every part of the plant—leaves, stem, and roots—has been utilised for storing the surplus food. The building up of new tissues has ceased. The activity of the plant is now directed to utilising this food in the production of the seed. This will be more apparent if we consider the actual increase in weight of the dry matter of the plant, excluding the roots, at three stages of its life—the end of March, the end of June, and at harvest. Of the dry matter of the ripe plant 20 per cent. was present by the end of March, when some four leaves were visible ; 45 per cent. was added by the time it was in full flower at the end of June ; and the remaining 35 per cent. before harvest. This 35 per cent. is not, however, an addition to the weight of the plant by the production of new food, the greater portion of it had already been prepared, and had been sent down into the roots, to be in store there until it was needed. When the flowering is finished, it is transferred

from the underground parts of the plant to be finally stored in the seed, and necessarily increases the weight of dry matter in the plant above ground.

VII. Ripening of the Grain.

(The figures printed in the margin refer to the corresponding figures on page 98.)

1 As soon as the ovule has been fertilised by the pollen-tube,
2 active subdivision and increase of the cells take place, and the
3 embryo is gradually developed. The stamens having done their
work dry up and fall off, and the feathery styles wither and
disappear. Hitherto the crude sap has been passing up the
plant from the roots to the leaves; now the stored starch, con-
verted, by the action of the protoplasm in the cells containing
it, into grape sugar (*glucose*), is being sent from every part of
the plant up to the seeds. A steady stream from leaf and stem
4 and roots passes up through cell after cell to supply the proto-
5 plasm of the seed with material to build up the tissues of the
6 little plant or to be stored up as starch for its future use. Day by
3 day a steady enlargement of the seed goes on. The cells of the
6 outer wall of the ovary are absorbed until it is gradually reduced
11 to a single layer in the ripe grain. The covering that belongs
14 to the seed itself, which is difficult to separate in the ripe seed,
can be easily observed in these early stages. The fully developed
7 embryo should be taken out of the seed and its different parts
8 examined—the roots at the one end and the leaves at the other
15 of the short stem, and the relatively large scutellum connecting
the little plant with the store of food. When ripe every cell in
the rest of the seed is packed with starch, and the protoplasm,
which has followed the starch in its progress from all parts of
the plant to the seed, is hardened into gluten for preservation
and stored up by itself in the series of cells immediately under
the skin of the grain, or scattered among the starch through the
other cells. The entire store of food is called the *endosperm*.

The whole life of the plant has been leading up to the production of these perfect seeds. From the time the first green leaf was expanded, the plant has been converting water and carbon and nitrogen into organic compounds, and building them up into its own structure or storing the surplus for use in this final work. The whole of this surplus material collected from every part is now stored up in the seed, and nothing remains in the plant but a skeleton of empty cell walls and dry woody fibres. The plant has done its work and dies—root and stock—leaving its numerous seeds each to reproduce an independent plant when the necessary conditions of heat and moisture are present.

VIII. The Wheat Straw.

(*The figures printed in the margin refer to the corresponding figures on page* 99.)

The principal function of the stem or straw of the wheat is
to serve as the medium of communication between the leaves
and the roots. It also carries the leaves up from the ground 1
and enables them more efficiently to do their work in the air 7
under the influence of the sun; and in its green portions it
supplements the proper work of the leaves.

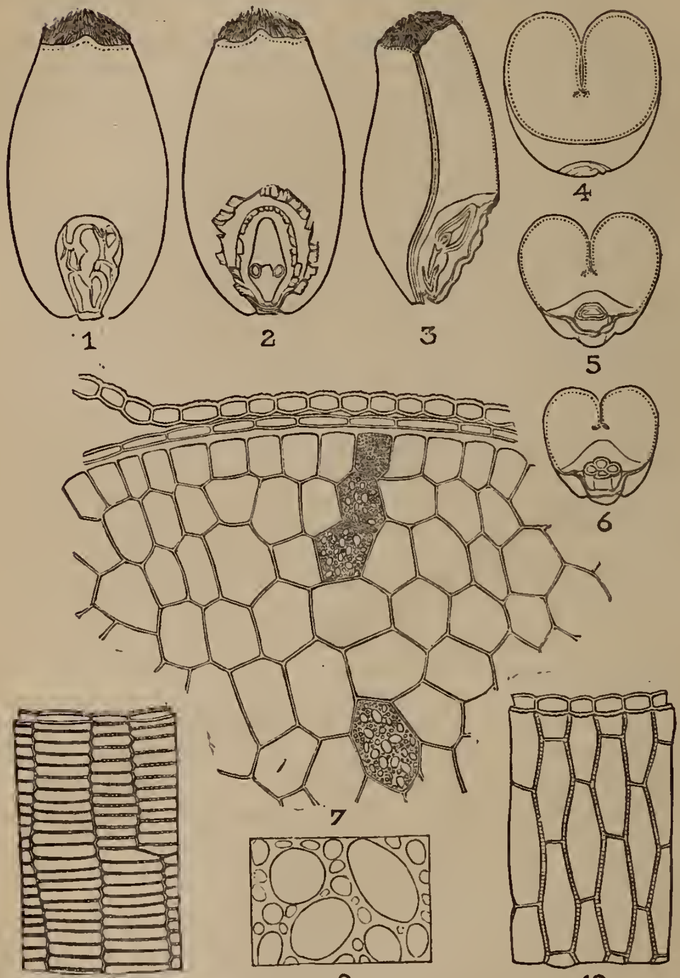
We noticed that by the end of April all the joints of the iv
straw were present in the young plant, each furnished with its 5
own leaf. The joints were close together and the straw solid. The subsequent lengthening of the straw has been caused by the gradual separation of the joints by the growth of every part of the intervening stem. In expanding in the air the stem is carried up without encountering any barrier to its progress. The rapid growth of the joints below does not, therefore, inconvenience the growing stem. It is very different, however, with the root, which has to seek its way between particles of the soil, and to turn aside when it meets with a stone or other obstacle. A lengthening of the already formed parts would effectually prevent the growing root penetrating the soil, and so, as we have already seen, the root increases in length only at its thread-like extremity.

The straw increases in width as well as in length, and this
growth tears up and destroys the cells which filled the centre in
its early state. A hollow cylinder with solid joints is conse- 4
quently produced. Such a stem gives the necessary strength
without using up the large amount of food that would be re-
quired to form a solid stem, which at the end of the short life
of the wheat plant would leave an excessive amount of waste
material. The strands of vascular bundles symmetrically
arranged in the cylinder of the stem, besides the other functions 6
they perform, add strength to the straw.

The leaf is attached to the stem at the node or joint. A 2
little above the place of attachment the sheath of the leaf swells 3
out round the stem forming the knob. The sheath surrounds 5
the stem for a considerable distance before the blade of the leaf is given off. The stem has alternate fine lines of green and white; the skin covering the green lines is perforated with stomates, and the green cells below perform the functions of the similar cells in the leaves, taking in carbon and uniting it with oxygen and hydrogen to make starch.

W. Carruthers.

I. THE STRUCTURE OF THE GRAIN.

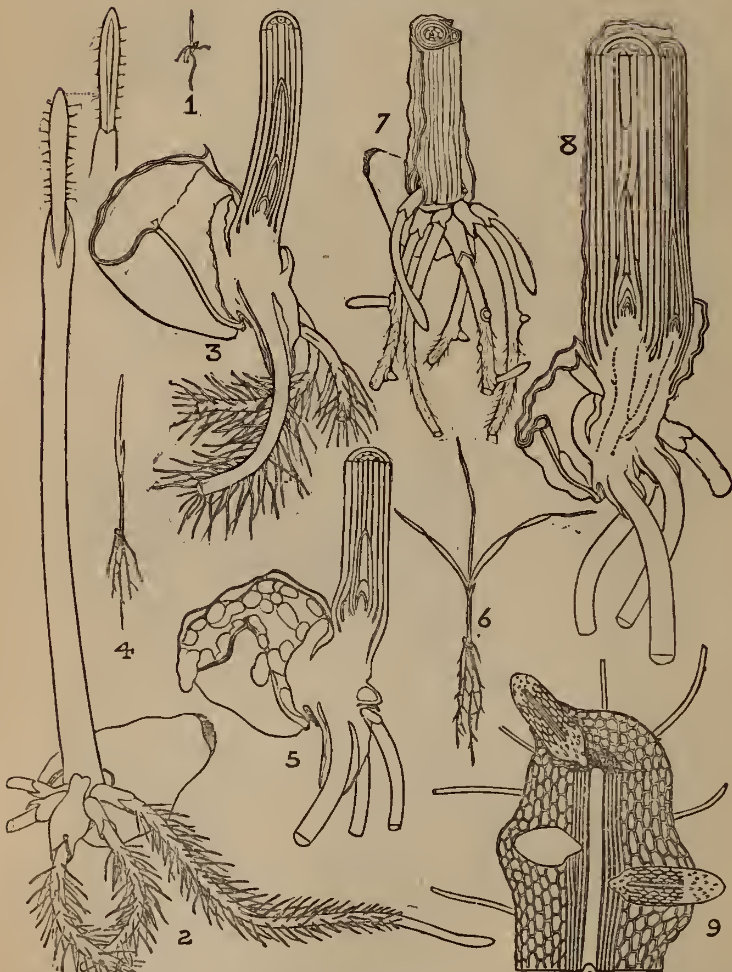


1. The grain, × 6 times.
2. Embryo of 1 exposed, × 6 times.
3. Section of 1, × 6 times.
4. Transverse section of 1 through endosperm, × 6 times.
5, 6. Transverse section of 1 through the embryo, × 6 times.
7. Section of part of a grain showing the stored gluten and starch, × 120 times.
8. Starch grains, × 520 times.

II. GERMINATION OF THE GRAIN.

1. Grain sown three days, × 4 times.
2. Section of 1, × 6 times.
3. Grain sown five days, × 4 times.
4. Section of 3, × 6 times.
5. Grain sown eight days, × 4 times
6. Section of 5, × 8 times.
7. Section of the leaf and sheath of 5, × 30 times.
8. Section of piece of leaf of 7, × 120 times.
9. Skin and stomates of leaf, × 120 times.
10. Section of root of 5, × 40 times.

III. THE YOUNG PLANT.

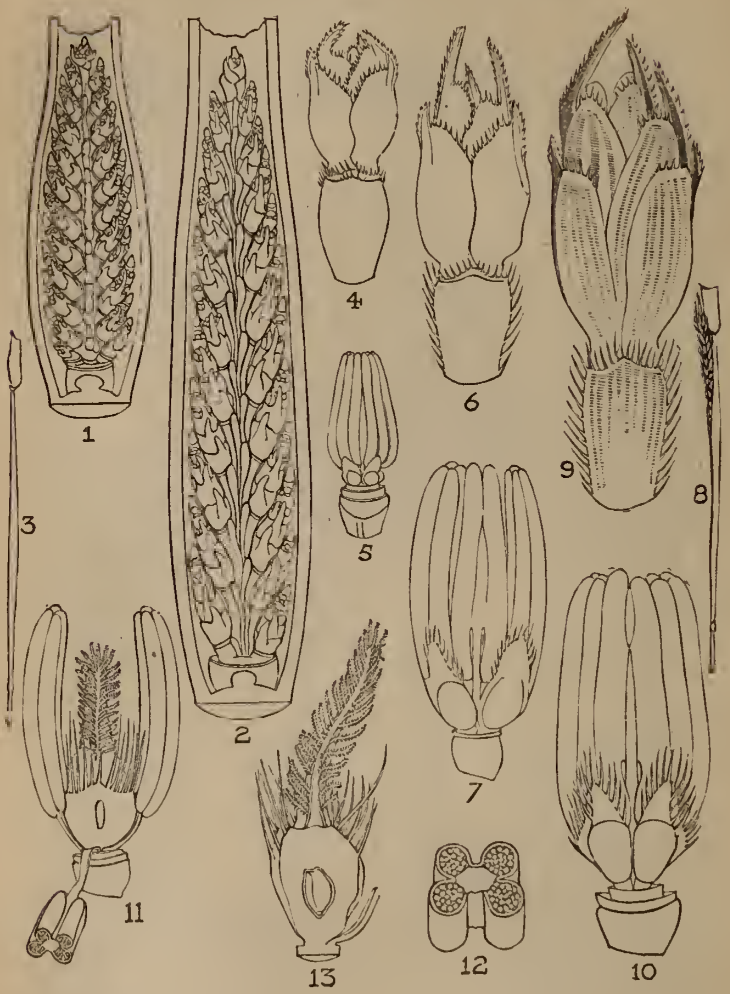


1. First leaf emerging, $\frac{1}{3}$ nat. size.
2. Figure 1, × 4 times.
3. Section of part of fig. 2, × 6 times.
4. Young plant with a second leaf, $\frac{1}{3}$ nat. size.
5. Section of part of fig. 4, × 6 times.
6. Young plant with three leaves, $\frac{1}{3}$ nat. size.
7. Part of 6, × 3 times.
8. Section of 7, × 6 times.
9. Section of root with young rootlets, × 40 times.

IV. EARLY GROWTH OF THE EAR.

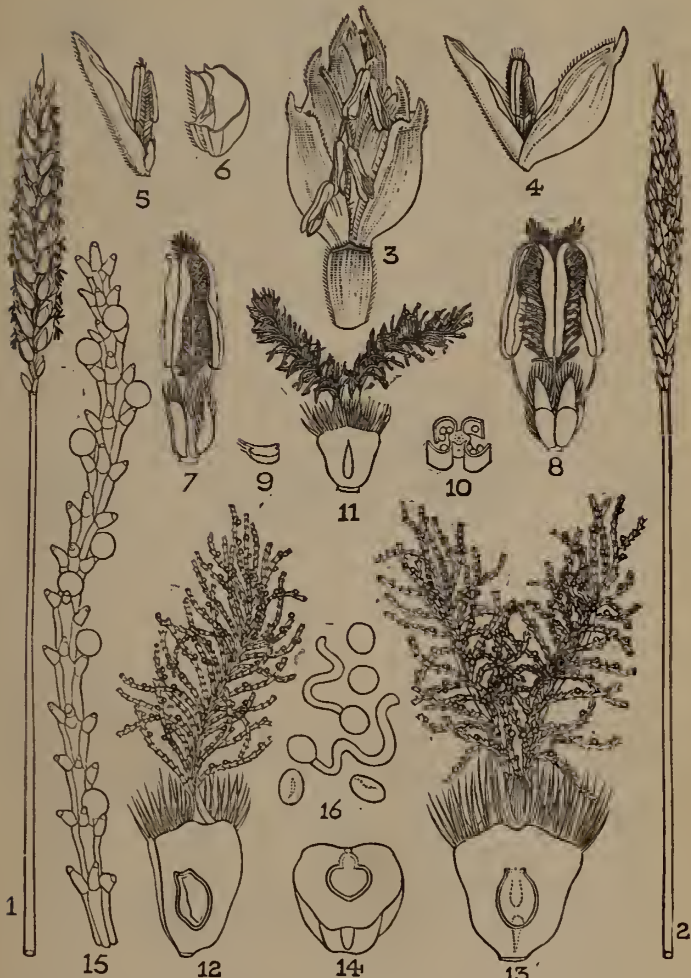
1. Plant, March 24, $\frac{1}{5}$ nat. size.
2. Centre of stem of 1 with young ear, × 16 times.
3. Plant, April 22, $\frac{1}{5}$ nat. size.
4. Lower part of 3, × 3 times.
5. Section of 4, × 3 times.
6. Section of stem of 3 with young ear × 16 times
7. The ear, April 28, × 16 times.
8. The ear, May 5, × 16 times.
9. The ear, May 12, × 16 times.

V. GROWTH OF THE EAR AND FLOWER.



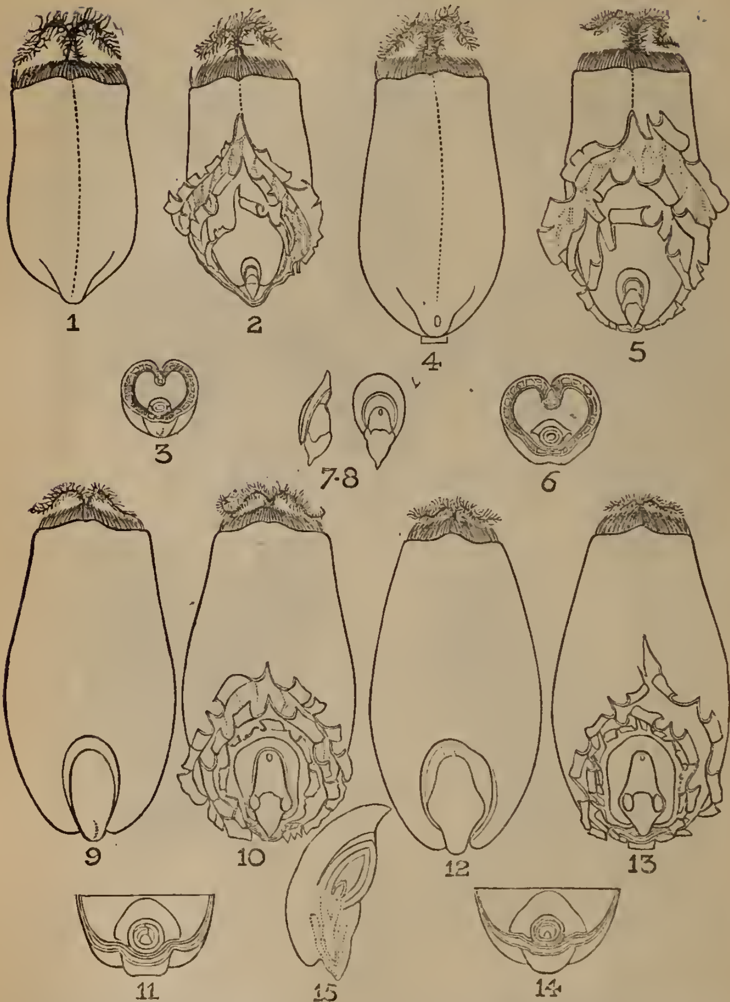
1. The ear, May 19, × 8 times.
2. The ear, May 26, × 8 times.
3. The ear within its sheath, June 2, ½ nat. size.
4. Spikelet of 3, × 4 times.
5. A flower of 4, × 8 times.
6. Spikelet taken from an ear, June 9, × 4 times.
7. A flower of 6, × 8 times.
8. The ear emerging from sheath, June 16, $\frac{1}{5}$ nat. size.
9. Spikelet of 8, × 4 times.
10. A flower of 9, × 8 times.
11. The same flower (10) showing the young grain, × 6 times.
12. Section of anther of 10, with ripe pollen, × 10 times.
13. Section of young grain of 11, × 10 times.

VI. THE FLOWER.



1. Ear in flower, June 20, ⅓ nat. size.
2. Another view of 1, ⅓ nat. size.
3. Spikelet of 1, × 2 times.
4. A flower of 3, × 2 times.
5. The same flower (4) without the glume, × 2 times.
6. Section of glume and pale of 4, × 2 times.
7, 8. Flower with lodicules, stamens, and style, × 4 times.
9. Section of a lodicule of 7, × 6 times.
10. Transverse section of a burst anther, × 8 times.
11. Ovary and styles with pollen grains, × 4 times.
12, 13. Section of 11, × 8 times.
14. Transverse section of ovary of 11, × 8 times.
15. A hair of the style of 11, × 80 times.
16. Pollen grains, entire, emitting the tubes and empty, × 80 times.

VII. RIPENING OF THE GRAIN.

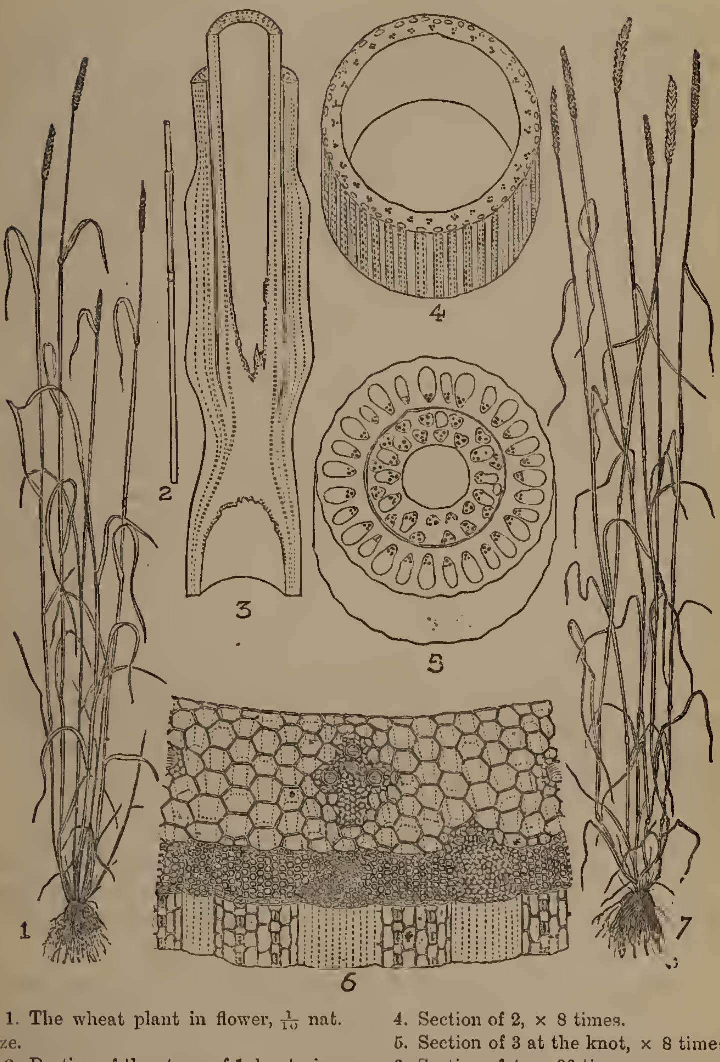


1. Grain, June 23, × 5 times.
2. Embryo of 1 exposed, × 5 times.
3. Section of 1 through the embryo, × 5 times.
4. Grain, June 26, × 5 times.
5. Embryo of 4 exposed, × 5 times.
6. Section of 4 through the embryo, × 5 times.

7, 8. Embryo of 4 detached, × 8 times.

9. Nearly ripe grain, × 5 times.
10. Embryo of 9 exposed, × 5 times.
11. Section of 9 through the embryo, × 5 times.
12. Fully ripe grain, × 5 times.
13. Embryo of 12 exposed, × 5 times.
14. Section of 12 through the embryo, × 5 times.
15. Section of the embryo of 12, × 8 times.

VIII. THE WHEAT STRAW.



1. The wheat plant in flower, $\frac{1}{10}$ nat. size.
2. Portion of the straw of 1, $\frac{1}{5}$ nat. size.
3. Section of 2, × 4 times.
4. Section of 2, × 8 times.
5. Section of 3 at the knot, × 8 times
6. Section of 4, × 80 times.
7. The plant in seed, $\frac{1}{10}$ nat. size.

ENGLISH MARKETS AND FAIRS.

In these days of the telephone, the telegraph, and the train we are perhaps apt to under-estimate the supreme importance which in a less advanced stage of civilisation attached to the provision of local facilities for the disposal of the produce of the soil. In a sense the farmer is still, and inevitably must be, the slave of his market, but in the olden days he was so in a much narrower and more absolute sense than now. When buying and selling were entirely matters of personal intercourse, the market or fair afforded practically the only means by which the producer and consumer came into contact. Consequently, all such institutions were of supreme importance, alike to the inhabitants of the towns and to the tillers of the land.

The distinction between a market and a fair is well understood, though it is not very clearly defined. A market, viewed in its strictly legal aspect, is an authorised public concourse of buyers and sellers of commodities, meeting at a place more or less strictly limited or defined at an appointed time. A fair is a large market held less frequently, and commonly extending over a longer period. "Every fair," says Lord Coke, "is a market, but every market is not a fair." But though the term market is the more comprehensive, the fair is the older institution. The word fair signifies a gathering at the time of one of the annual religious feasts, and is derived, according to Messrs. C. I. Elton and B. F. C. Costelloe,[1] from *feria*, which is the proper ecclesiastical term for a saint's day. These feasts were no doubt frequently a continuation of still older pagan festivals, which, in addition to their character as religious functions, were from the earliest times utilised for purposes of trade and commerce as well as for pleasure. It appears to be impossible to dissociate the fair from the festival in early English history, and there is no doubt that, in their original form, the gatherings were held on those great occasions when the national sacrifices were offered and the public assemblies held.

There is very little reference to fairs either in the collection of laws or other authorities relating to the period of English history preceding the Norman Conquest, although there is no doubt that such annual gatherings took place in many parts of England throughout the whole period between the establishment of the Teutonic kingdoms in England and the imposition of the Norman constitution.[2]

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[1] *Report to the Royal Commission on Market Rights and Tolls on Charters and Records relating to the History of Fairs and Markets in the United Kingdom.*

[2] *Ibid.*, p. 3.

Domesday book only mentions two fairs, and gives no complete list of existing markets. It appears probable, however, that the compilers of that record only took into account any sources of revenue accruing to the king, and would consequently ignore such institutions as did not possess pecuniary claims on their attention. After the Norman Conquest the native British fair seems to have been reconstituted on the continental model, and it was recognised as a valuable source of revenue to the Crown. As foreign trade developed in the reign of the Plantagenets, the institution of the annual fair rose in importance, and during several centuries it filled a not inconsiderable position in the commercial life of the country. The fairs were only shorn of their serious importance—except for special purposes—by the progress of the world, and by the discovery of swift means of intercommunication. When the growth of trade progressed faster than the improvement of the means of communication, the value of fixed centres of periodical exchange was great; but, as the means of communication improved, the great marts of Plantagenet, Tudor, and Stuart times have, as Professor Rogers observes, "degenerated into scenes of coarse amusement, and after having been granted and protected as the highest and most necessary franchises, have been tolerated for the sake of their traditions, and are now being generally suppressed as nuisances." Mr. A. J. Ashton, one of the Assistant Commissioners on Market Rights and Tolls, after holding thirty-four public inquiries in the South and West of England, reported that the fairs are decaying all through that part of the country. The cattle fairs, he observed, are being spoilt by the cattle markets, and the pleasure fairs are decaying and ought to be stopped.

The extent to which fairs have died out within the present century is indicated by a return given as an appendix to the report of Messrs. Elton and Costelloe, which has been already referred to. This gives a complete list of fairs existing in England and Wales in 1792, according to *Owen's New Book of Fairs* arranged in counties, and compared in parallel columns with the list of fairs published for the year 1888. The summary on page 102, compiled from this list, may be interesting as showing the relative number of fairs existing in each county at the respective dates.

The extent to which the fairs have died out in some counties is startling, as, for instance, in Kent, where 130 have dwindled to 13. But it is, perhaps, even more surprising to observe that in other counties—though they are not many—the number of fairs has actually increased. Lancashire, Cheshire, Cumberland, and Cornwall, and one or two of the Welsh counties are chiefly

noteworthy in this respect. It should be mentioned that the bare figures do not show the whole of the changes which have taken place. In several instances where little alteration is shown in the number of fairs existing in the county, there have, nevertheless, been some which have been extinguished, though others have sprung up in different places. There is no doubt that a good number of the defunct fairs owe their decease to the operation of the Fairs Act of 1871, which enables a Local Authority, with the sanction of the Home Secretary, to abolish any fair.

Counties	1792	1888	Counties	1792	1888
Anglesea . .	8	8	Lancashire . .	43	52
Bedfordshire .	16	14	Leicestershire .	15	14
Berkshire . .	25	14	Lincoln . .	52	39
Brecknock . .	6	5	Merioneth . .	14	11
Bucks . .	24	20	Middlesex . .	13	5
Cambridge . .	12	8	Monmouth . .	12	18
Cardigan . .	13	8	Montgomery .	6	11
Carmarthen .	29	21	Norfolk . .	76	27
Carnarvon . .	18	9	Northampton .	21	18
Cheshire . .	15	21	Northumberland	20	19
Cornwall . .	36	42	Oxon . . .	19	18
Cumberland .	18	24	Pembroke . .	12	23
Denbigh . .	24	6	Radnor . .	7	9
Derby . .	24	24	Rutland . .	2	1
Devon . .	72	37	Shropshire . .	27	19
Dorset . .	43	26	Somerset . .	97	52
Durham . .	10	16	Stafford . .	29	24
Essex . . .	95	15	Suffolk . .	69	13
Flintshire . .	11	5	Surrey . .	35	17
Glamorgan .	16	16	Sussex . .	119	41
Gloucestershire .	37	32	Warwick . .	16	18
Hampshire .	56	24	Westmoreland .	10	14
Hereford . .	15	11	Wilts . . .	43	28
Hertfordshire .	31	10	Worcester . .	20	12
Hunts . .	13	6	Yorkshire . .	101	84
Isle of Man .	—	11			
Kent . . .	130	13	Totals . .	1,691	1,055

Much has been said in condemnation—and, indeed, little can be said in defence—of the "pleasure fair" as it now survives. Those who have had the opportunity of observing, and *hearing*, a big pleasure fair, such as St. Giles's fair at Oxford, will probably agree that, if it possesses redeeming features, they are, to say the least, not very conspicuous. But it would be unfair to include all in one sweeping anathema. No doubt a legitimate excuse for the survival of a fair often exists where it has been made solely or mainly an occasion for selling cattle or sheep. Mr. Ashton, however, reported that in the South and West of England "cattle fairs are fading away very much," and he thought that in a few years they will disappear altogether.

As a matter of fact there is, and always has been, generally speaking, more direct agricultural interest in markets than in fairs. Obviously, the regular weekly or bi-weekly market must primarily have been intended for the sale of food, while the periodical fair would naturally be devoted rather to the provision of commodities of less frequent use.

The English market system grew up by means of royal grants; and, generally speaking, the ordinary means, up to a recent period, by which a market was established was by soliciting and obtaining a concession from the Crown of the franchise or privilege to hold a market. It is scarcely necessary to examine how or when this prerogative of the sovereign arose, but it certainly dates in this country from the earliest times, and is stated by Messrs. Elton and Costelloe to be of Frankish origin. At any rate, in the early English kingdoms the right of holding markets was among the *jura regalia*, which might be made matter of grant and transferred as a franchise into the possession of a subject. It is noteworthy that the market right was always granted in England to individuals; even when the franchise was enjoyed by a corporation, its origin was, in theory, independent of the ordinary municipal privileges. In Scotland, on the other hand, the right of market appears as one of the ordinary privileges of a trading town.

The extent to which, when the country commenced to become developed, this prerogative of the Crown was invoked may be gathered from the fact that during the 285 years from 1199 to 1483 over 2,800 grants of markets and fairs were made, and more than half of these were made during the first seventy-four years of that period. It may be of interest to add, for comparison with a much later time, that during the period 1700 to 1846 the number of grants was ninety-three. Since the abolition of the system of royal grants, many markets have been established under Act of Parliament, and subject to the supervision of the Local Government Board, which, however, only deals with markets in the hands of local authorities. The Table on page 104 shows concisely the various authorities under which market rights are now exercised in England and Wales, and the different owners to whom these rights belong.

This table, which is taken from the Final Report of the Market Rights and Tolls Commission, does not account for the title and ownership in the case of 174 of the present markets, while in ten cases it shows that the right to hold a market is not exercised. As regards the thirty-three instances where no rights are claimed and no markets are held, it may be explained that they appear in this Table because, in a return

presented to Parliament in 1886, they were specified as places where "a resemblance of a market was at that time to be found."

Alleged title or authority for markets	Owners			Bodies of persons other than trading companies	Quasi markets held under questionable rights, or information defective	Places where no markets are now held	Total
	Local authorities	Trading companies	Private persons				
1. By royal grant, charter, letters patent, &c.	90	6	110	18	—	8	232
2. By prescription	17	8	43	6	—	2	76
3. By charter or prescription, confirmed or regulated by statute	41	—	4	1	—	—	46
4. By statute (general)	40	—	—	—	—	—	40
5. By statute (special), local and private Acts	42	20	5	7	—	—	74
6. By purchase or grant	79	—	—	1	—	—	80
7. Particulars not ascertained	1	14	97	3	4	14	133
8. No market rights claimed	3	16	15	3	18	33	88
	313	64	274	39	22	57	769

Of the 769 markets, or vestiges of markets, enumerated, it appears that 261 were in boroughs, 266 in other urban districts, and 242 in rural districts.

On the amount of the income which the various market owners obtain by virtue of the rights granted to them, the Reports of the Inland Revenue Commissioners throw some light. In the year ending April 5, 1890, the following was the amount of the gross assessment to Schedule D of the Income Tax under the head of "Markets, Tolls, &c."

	£
England	528,441
Scotland	25,413
Ireland	47,867
United Kingdom	601,721

There has been no great variation in the amount during the last ten years at least. Thus, in 1880–81, the total amount was 601,577*l*. It should be borne in mind that part of this sum is no doubt interest on money expended.

Closely connected with the right of holding a market was that of keeping standard weights and measures; and it may be

added that the market owners in some cases, at least, provided sworn meters for measuring cloth, corn, salt, &c. Possibly to this cause—in part at least—is due the remarkable diversity of local weights and measures, each being recognised as a standard in its particular district. So far as the regulation of markets was concerned, the main object of all the ancient laws and usages was to provide for fair dealing, and to prevent and punish chicanery. The following passage, quoted from the *Liber Albus* of the City of London, is a good instance both of the "tricks of the trade" current in mediæval times, and of the solicitude with which the authorities sought to defeat them—[1]

And whereas some buyers and brokers of corn do buy corn in the city of country folks who bring it to the city to sell, and give, on the bargain being made, a penny or halfpenny by way of earnest; and tell the peasants to take the corn to their house, and that there they shall receive their pay. And when they come and think to have their payment directly, the buyer says that his wife at his house has gone out and has taken the key of the room, so that he cannot get at his money; but that the other must go away, and come again soon and receive his pay. And when he comes back the second time, then the buyer is not to be found; or else if he is found, he feigns something else, by reason whereof the poor men cannot have their pay. And, sometimes, while the poor men are waiting for their pay the buyer causes the corn to be wetted; and then, when they come to ask for their pay which was agreed upon, [they are told] to wait until such a day as the buyer shall choose to name, or else to take off a part of the price; which if they will not do, they may take their corn and carry it away; a thing which they cannot do, because it is wetted, [and] in another state than it was when they sold it.

Any person "towards whom such knavishness" as this is committed is to complain to the Mayor, and the shifty buyer, on conviction, is to pay "double the value and full damages as well," or, in default, to stand in the pillory.

Another of these enactments—which probably refers to the time of Edward I., and no doubt then merely codified long-established custom—states that two loaves of bread are to be made for one penny, and that no loaf is to be baked of bran. The bakers generally were under severe restrictions, and it was provided that if "any default" were found in the bread of a baker of the city, he was, for the first offence, to be drawn on a hurdle from the Guildhall to his own house "through the great streets where there may be most people assembled, and through the great streets that are most dirty, with the faulty loaf hanging from his neck."

The necessity for guarding against dishonest dealing lies at the very root of the market system. One main object which the market served was to secure publicity of sale, so that there

[1] *First Report of Market Rights and Tolls Commission*, Vol. I., p. 47.

might be credible witnesses to the transfer of property. In the tenth century an effort appears to have been made to prevent all buying and selling, even of cattle, except in a market town. According to the laws attributed to William the Conqueror, sales were only allowed to take place in cities, walled towns, castles, and other safe places where there was sufficient good government and security to insure respect for the authority of the common law and the maintenance of the rights of the Crown. These reasons, however, say Messrs. Elton and Costelloe, may have been due to "an after-thought of the Norman lawyers," the principle of the English laws on the subject having been based on the expediency of having a special class of witnesses for the transfer of property. The notion that only a class of persons of exceptional credibility should be allowed to attest sales runs through the whole of the enactments. In most of the English towns there was a class of persons who were the "good" or "credible" or "lawful" men of the town. These were regarded as an official class, and were gradually organised into an official body.

The chief officer of the trading town in Anglo-Saxon times was the "port reeve,"—London, Canterbury, Bath, and Bodmin being instances of towns where records of such an official exist. All transactions in the market were made before the port reeve, or some person appointed by him, or in the presence of two or three "credible witnesses." Such a sale in "market overt" gave the buyer a title against all comers. Mr. G. Prior Goldney, the City Remembrancer, in evidence before the Market Rights and Tolls Commission, referred to this as one of the early advantages of the establishment of markets. Whereas, in the private sale of goods, the vendor could give no better title to the goods than he himself possessed, and therefore the purchaser would by law be compelled to restore them to anyone who could prove a better title, by sale in "market overt" the purchaser acquired a perfectly good title—of course, direct fraud being supposed to be absent. Thus, if a man stole a bullock and sold it in "market overt," the purchaser became the lawful proprietor, and could hold it against all claimants; but there was a rather odd exception to this rule made in the case of horses, which did not come under the law of "market overt." To constitute a sale in "market overt," the commodity sold must be actually in the market during the whole of the transaction from the making of the contract to the delivery.

In close connection with these customs and regulations may be mentioned the Court of Pie Poudre, which is described in Blackstone's Commentaries as being "a court of record, inci-

dent to every fair and market of which the steward of him who owns or has the toll of the market is the judge, and its jurisdiction extends to administer justice for all commercial injuries done in that very fair or market and not in any preceding one, so that the inquiry must be done, complained of, heard, and determined within the compass of one and the same day, unless the fair continues longer." The officer of this court was above all judges and justices, and could settle all disputes in a summary way, "like an oriental cadi," to quote an illustration used by Mr. Elton.

It does not appear that the Pie Poudre Court now survives in any place, though in Bristol it existed in form up to a comparatively recent date. In the *Dictionary of Bristol* it is stated that, until about the year 1874, under the porch of the ancient hostelry known as the "Stag and Hounds," Old Market Street, a solemn farce was performed annually on September 30, by the formal opening of this court. It is said to have originated in the reign of Alfred, and was established for the settlement of disputes which arose during the Bristol fair. The opening ceremony was as follows:—A procession walked from the Council House to Old Market Street, consisting of the sheriffs, a seneschal, sergeant-at-mace, and other officers; on arrival at the "Stag and Hounds," toasted cheese, cider, and metheglin—a Saxon wine peculiar to the western counties—were distributed amongst the parties doing business at the court. This latter custom was abolished some years before the extinction of the court, because the people used to tilt the bowl, and upset the liquor over one another; consequently, fees were substituted for refreshments. The court having been duly opened, the business was conducted at the "Tolzey Court Office," from September 30 to October 15 inclusive. The Pie Poudre Court is now incorporated with the "Tolzey Court," which is a tribunal of equal antiquity, being the "most ancient Court of Record by prescription." When the Castle of Bristol became a royal residence, the old Court of the Hundred became united to the Palace Court, in which the King's seneschal was assisted by the bailiff. The court was held at the "Tolzey," a place where the King's tolls and duties were collected, and it was called the Court of Tolzey—the word being said to be derived from "toll." In this court all actions of debt, covenant, trespass, and other civil actions arising within the city could be prosecuted by action or by foreign attachment, and its jurisdiction extended to the whole of the county of the city on land, and by water to the Flat and Steep Holmes.[1]

[1] Two islands in the Bristol Channel.

It goes almost without saying that, during the long history of market rights, abuses had crept in and disadvantages had been developed. Naturally, these were chiefly in connection with the tolls levied by market owners. Toll, it may be mentioned, was not incident to a fair or market without a special grant, though it is probable that all market owners possess the right to levy it. In many cases—if not originally in all as regards produce—the toll was in kind, and this antiquated form of payment still continues in a few instances. Thus, at Berwick, one egg from every thirty is taken ; at Guildford, a pint of corn is taken from every sack ; at Devizes, two quarts of corn are taken from each lot ; and, at Penzance, two quarts are taken from every bushel of corn.

The customs anciently payable in the City of London, according to the *Liber Albus*, were in many cases tolls in kind. Thus :—

> The cart that brings planks of oak shall give one plank.
>
> Every cart that brings leeks in Lent shall pay one penny and one fesselet of leeks.
>
> The vessel that brings mackerel shall give six and twenty mackerel, the franchise excepted.

In " Smythefelde " the customary charges were one penny for every full-grown cow or ox, and for every dozen sheep sold.

It is difficult to give in a brief space any fair idea of the present range of tolls in the various markets throughout the kingdom. As regards cattle markets, however, we have compiled the following table, which may be of interest as showing the present tolls charged in a few fairly representative markets :—

Market	Cattle	Sheep	Pigs	Horses	Pens for animals
	per head *d.*	per head *s.* *d.*	per head *s.* *d.*	per head *s.* *d.*	
Islington . .	6	$1\frac{1}{4}$	$1\frac{1}{4}$	$7\frac{1}{2}$	
Barnstaple . .	3*d.* if sold; 1*d.* if unsold	$\frac{1}{2}$	1	6	
Guildford . .	6	1	1	6	
Leeds . .	2	$\frac{3}{4}$*d.* to 1*d.*	$\frac{3}{4}$*d.* to 1*d.*	3	
Liverpool . .	6	1	1	1 0	
Oxford . .	2	1	1	3	
Norwich . .	6	1	1	1 0	
		per score	per score		
Reading . .	6	1 8	1 8	6	
Taunton . .	3	1 8	1 8	1 0	
Barnsley . .	2	10	10	4	1*s.* for 7 sq. feet in addition to toll
Rochdale . .	6	1 4	1 4	6[1]	

[1] Stallions, 1*s*,

Generally speaking, it is chiefly in regard to animals that tolls are taken upon the "quantity" exposed for sale. In the case of corn, vegetables, meat, fish, &c., the more usual practice nowadays seems to be to charge a certain amount of rent for the occupation of a stall or situation in the market. There is an increasing tendency to substitute "stallage," or rents for space, for tolls on goods brought into the market. One evident advantage is that the trouble of enumerating and checking the entries of articles, of examining the dimensions of baskets, &c., is avoided, and fewer disputes are likely to arise. On the other hand, the substitution of a system of stallage in place of toll tends to suppress the small producer and to drive all the trade into the hands of the middlemen. The cottager with his basket of eggs, or the small farmer or gardener with his load of vegetables, cannot afford to rent a stall, and is consequently compelled—under an uniform system of stallage—to reach the consumer through the stall-holder.

Tolls and stallage are quite distinct, and may both be charged in the same market. In fact, the proceeds of each might belong to a different person. There is no reason, therefore, either historically or practically—so far as appears—why both systems should not continue, as in many cases they do, side by side in the same market.

An attempt has been made, though with very partial success, to ascertain the ratio which tolls bear to the prices of commodities sold in the markets. Most of the market owners from whom information was sought either ignored that particular inquiry, or, if they attempted an answer, replied "infinitesimal" or "impossible to say." A little information is forthcoming with regard to some of the chief London markets, from which it appears that, at the Central Meat Market, the toll amounts to $\frac{1}{441}$ of the price. At Deptford Foreign Cattle Market the toll ranges from $\frac{1}{35}$ in the case of calves to $\frac{1}{73}$ in the case of bullocks. At the Metropolitan Cattle Market the ratio is very much less, ranging from $\frac{1}{320}$ for calves to $\frac{1}{720}$ for bullocks. At Birmingham the toll on potatoes is $\frac{1}{30}$ of the price (or 8*d.* in the pound), and on butter $\frac{1}{80}$. Generally speaking, on high-priced articles sold in considerable bulk the toll is inappreciable; but on others, such as baskets of vegetables, eggs, butter, &c., it bears a more serious proportion.

The rights under which markets are held being, to say the least, in many cases rather obscure, it is not to be wondered at that instances are discoverable where the powers exercised exceed the limits laid down by charter or statute. The most frequent instance of this tendency is to charge tolls on other days than those authorised. Thus, for example, at Bridgwater, the market is authorised by Act of Parliament for three days in

the week, but tolls are—or were in 1888—taken every day. In Ireland the Royal Commission report that in many cases the market charges are "wholly unauthorised," and they observe that it would be somewhat hazardous, in the face of the enormous number of grants, to say with regard to any town of importance that a market had not been sanctioned for every day of the week except Sunday. In some cases two or three different charges appear to be imposed on the same commodity. Thus, at Carlisle, butter purchased in the market by a trader whose shop was in the suburbs paid four tolls, viz.: (1) the in-gate toll, (2) the market toll, (3) a packing toll, and (4) the out-gate toll. At Dorchester an instance was given, at a public inquiry held there, in which five separate tolls, amounting to 2*s.* 2*d.*, had been paid on one load of fish. Naturally, these reiterated charges give rise to much complaint—not always because their gross amount is excessive, but because of the annoyance and trouble which they occasion. A good many markets exist, no doubt, where, with a cheerful indifference to any Act of Parliament, the authorities have not published a list of tolls, and in some cases, indeed, have not even fixed them, the collector being allowed practically to follow the principle laid down by railway managers, and to "charge what the traffic will bear." The visits of the Assistant Commissioner, no doubt, did much to call the attention of market authorities to their liabilities and duties. Thus, at Oxford, an outward and visible sign of his visit was seen in the freshly-painted list of tolls which immediately afterwards appeared in the cattle market, and no doubt such effects were common. A characteristic incident is reported from Ireland. For many years, at a place called Gart, no toll board had been exposed on market and fair days, "because it was lost." On the very day on which the Assistant Commissioner held his public inquiry in that town, the missing board was found and produced before him.

In some market towns the inhabitants, the freemen, the burgesses, or some other privileged class are allowed certain advantages in regard to the market charges. In many instances auctioneers are charged an extra toll on all animals sold by them. At Leicester, Northampton, and Cambridge, for instance, they pay a triple toll. At Leeds they are still more discouraged, for no auctioneers are allowed to sell cattle either within or outside of the cattle market.

Among other anomalies the exemption from toll of certain commodities in some markets is curious. Thus, at Blackpool, butter, eggs, fresh fish and shell fish are specially excepted by statute. At Hastings, fish landed on the beach is toll free, while that brought by land pays toll—a very intelligible distinction.

At Knaresboro', Northallerton, and other places, butter and eggs are toll—free by custom. At Londonderry, the Corporation charge 2*d.* for each cart with buttermilk entering the city, whether taken to the market or not; but no toll is levied on carts with sweet milk. The explanation given of this remarkable distinction is that, when the Act was obtained, the members of the Corporation of that day were the principal vendors of sweet milk through the town, and they did not wish to tax themselves.

It is a little surprising to find that, in at least two towns—Newcastle-on-Tyne and Carlisle—there exists a charge which is substantially the same as the *octroi* of the Continent, being, in fact, a toll levied on all goods, cattle, carts, waggons, &c., passing into or out of the towns from the adjacent districts. They are known as "through" or "gate" tolls, and traces of similar charges under the name of street toll and passage toll are to be found at Cambridge and Dorchester. At Carlisle, in addition to the market tolls and stallages, the Corporation is entitled to what are known as "shire" and "gates" tolls leviable upon all goods taken into or out of the city of Carlisle or the county of Cumberland. The latter is now represented by a lump sum of 615*l.* paid by way of commutation by the Railway Companies, and from the former a sum of about 1,400*l.* is obtained annually. At Newcastle, the through toll is very similar, the main difference as compared with Carlisle being that its proceeds are much more valuable. The amount received at Newcastle for through toll in the year 1887 was 6,784*l.*, and the cost of its collection and other charges came to 1,243*l.*, leaving a balance of 5,541*l.*, which went in aid of the general rate of the city.

But, apart altogether from the burden, or assumed burden, of the tolls and charges, there are other grievances of which many complaints have been made more or less articulately and vehemently. Injury done to the community by a market monopoly could scarcely arise very grievously out of London; but, at any rate, one well-known case has occurred in the metropolis where the owners of an East-end market successfully resisted the right of any other persons to open a new market for the sale of fruit and vegetables within seven miles of the existing market. In some cases the insufficiency of market accommodation vexes the souls of sellers, if not of buyers. This, perhaps, is also especially a metropolitan grievance. At Billingsgate, for instance, the superintendent is pestered for more space, and could let double the area if it were available. There are some who think that the concentration of the food supply in a few great markets is not advantageous either to producers or consumers, and that its chief result has been the aggrandisement of a comparatively small number of middlemen.

Without attempting to present anything like what may be termed the "case" against the market owners, we have touched upon a few of the points which had engendered a certain amount of discontent in various parts of the country. With the view of inquiring into the reasons of that discontent a Royal Commission on Market Rights and Tolls was issued in July 1887 to inquire into the whole subject, and to report as to the alterations which might be desirable in the existing law relating to markets, having due regard to the interests of those concerned. The Commissioners were the Earl of Derby—who was chairman—Lord Balfour of Burleigh, the Right Hon. H. C. Childers, M.P., Sir J. P. Corry, Bart., M.P., Sir J. Martineau, Mr. Elton, M.P., Q.C., Mr. F. W. Maclean, M.P., Mr. Broadhurst, M.P., Mr. Spencer Charrington, M.P., Mr. (now Sir John) Harwood, Mr. W. C. Little, and Mr. McCarthy, M.P. Subsequently Mr. Broadhurst and Mr. McCarthy resigned, and Mr. Picton, M.P., and Mr. Pierce Mahony, M.P., were appointed in their stead. The Commissioners carried out the task entrusted to them with the most minute care; they appointed four Assistant Commissioners, who held 171 public inquiries in various towns in England and Ireland. The Commission itself held 50 inquiries and examined 195 witnesses. Altogether 3,261 witnesses were examined, and, in addition to this, a series of questions calculated to cover the whole field of inquiry was addressed to every owner of market rights in England and Wales, and to the owners of certain selected markets in Scotland and Ireland. The amount of the evidence collected on the subject may, perhaps, be indicated by the fact that it extends to fifteen substantial Blue-books.

The conclusions at which the Royal Commission arrived, and the recommendations which it made, have already been summarised by one of the Assistant Commissioners in the pages of this Journal.[1] We need not, therefore, here refer to them and to the several important political and social questions which they raise. But, with a promptness which eminently calls for recognition, two of the recommendations of the Commission have already, at the instigation of the Board of Agriculture, been passed into law, and it is fitting, therefore, that in these pages some special mention should be made of them.

The first of these recommendations (which was the twenty-fourth made by the Commission) ran as follows:

> That it is desirable that markets which are now required to be provided with machines for weighing cattle should be furnished with sufficient and suitable accommodation for the same; the question of sufficiency and suitability to be determined by the Board of Agriculture, after inspection.

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[1] R.A.S.E. Journal, Vol. II., 3rd Series (1891), p. 179.

It will be remembered that by the Markets and Fairs (Weighing of Cattle) Act of 1887 all authorities of cattle markets were directed to provide "weighing machines and weights for the purpose of weighing cattle," and, accordingly, machines were erected at the various markets throughout the kingdom. But the market authorities, compelled to incur an outlay for which they failed to see the need, complied in many instances only with the letter of the law, and ignored, or set themselves to defeat, its spirit. For instance, one of the Assistant Commissioners who visited a large number of the English markets reported to the Royal Commission that weighbridges were not generally placed in convenient situations. He observed that "wherever you have an important market—as you have at Wakefield—for cattle, it struck me as being almost ridiculous to have a small weighbridge upon which it is exceedingly difficult to get a fat beast to stand." He remarked, further, that though some market authorities had done their best to erect suitable weighbridges in convenient situations, others had not seemed to care about the efficiency of the machines. Other evidence bearing out this opinion might be cited, but it may be said that market authorities had taken, as a rule, no trouble to do more than the Act absolutely commanded, and, unfortunately, no provision had been made for seeing that the facilities provided were sufficient for, or suitable to, the requirements of the markets. Hence arose the recommendation of the Royal Commission on the subject.

The other recommendation referred to was the twenty-sixth, which was as follows:—

> That it is desirable to collect statistics of the market prices of meat, and, in particular, that the prices of cattle at per stone, live-weight, should be collected (in the same manner as the prices of corn are now returned) in such markets as may be selected for the purpose by the Board of Trade.

This is a reform which has long been urged by leading agriculturists and agricultural statisticians. It is interesting to recall that the Council of the Royal Agricultural Society, in June 1888—incited thereto by Mr. Pell, who was seconded by the late Mr. Little, and supported by Colonel (now Sir Nigel) Kingscote—unanimously resolved that it is desirable that the Government "should collect, and publish in an official form, the market prices of meat as they do of corn."

The official record of the live-weight prices of stock is a corollary of the practice of weighing cattle at markets. Nothing, it will be admitted, can be more unsatisfactory than a system under which the seller does not know—and has no means, other than personal observation, of knowing—what price his animals

fetch. Yet, under the common system, no farmer who sends his beasts to a salesman is able to check any statement which is made to him as to the prices current for the class of animals which he sold. Thus, to quote from evidence given by Sir John Lawes before the Royal Commission, it is possible to know with very great accuracy, by weighing them alive, what animals will weigh when dead; but, said Sir John Lawes, "if I send to the London market and look at the quoted prices for that meat in the paper, I find that instead of my animals weighing, when killed, 55, 56, or 58 per cent., as I know they ought to weigh, they only weigh, perhaps, 50 or 51 per cent., I know with absolute certainty that the figures are misleading and incorrect." It is true that some attempt was made to publish the prices in the newspapers, and more recently, in *The Times* and other papers, live-weight prices have also been periodically given. The latter are, so far as they go, useful, but the former were either so indefinite as to be meaningless or so inaccurate as to be misleading. As a rule the papers report the prices in the vaguest terms. Their value was well illustrated by Mr. Pell in his evidence before the Royal Commission. The newspaper reports, in relation to the market at Leicester, week after week described the market as being "better," and stated that prices had risen a halfpenny per pound; so that, observed Mr. Pell, "if those reports were worth anything, beef would be standing now at something like 30*s.* a pound. I looked at the report yesterday, and I found just the same thing —that prices were about a halfpenny per pound better."

The advantage of accurate price records is twofold: market reports, if inaccurate, may mislead farmers and producers in sending forward their supplies to market; again, inaccurate or incomplete market reports are misleading to the consumer, as showing the wholesale prices to be on a totally different level from that on which they really stand, preventing fair comparison with what is charged in the retail trade for commodities, and generally hindering business. They would be an advantage— as mentioned by Major Craigie before the Royal Commission— to agriculturists and statisticians and to the public generally, and they would have the effect of equalising prices, and perhaps preventing "gluts" by drawing supplies to the markets where the quotations were high.

These two recommendations of the Commission, viz., for the better provision of facilities for weighing cattle, and for the collection of live-weight prices at markets, were given effect to by the Markets and Fairs (Weighing of Cattle) Act of 1891. This measure provides that market authorities having to erect weighbridges shall provide and maintain "sufficient and suitable accommodation" for weighing cattle to the satisfaction of

the Board of Agriculture. Consequently, where insufficient or unsuitable facilities are given, farmers will be able to appeal to the Board of Agriculture to insist on their provision.

As regards the collection of live-weight prices, the Act compels the authorities of certain selected markets to send to the Board of Agriculture, in such a form as the Board may prescribe, returns showing the number of cattle entering, the number and weight of the cattle weighed, and the price of those sold. The market authority is given power, for the purpose of making a return, to cause any cattle to be weighed. The markets from which returns are to be made are: in England—Ashford, Birmingham, Bristol, Leicester, Leeds, Lincoln, Liverpool (Stanley Market), London (Metropolitan Cattle Market), Newcastle-on-Tyne, Norwich, Salford, Shrewsbury, Wakefield, and York; in Scotland—Aberdeen, Dundee, Edinburgh, Glasgow, and Perth; in Ireland—Belfast, Cork, and Dublin. The Act further provides that auctioneers, unless exempted by the Board of Agriculture, are to erect weighbridges in their sale-yards and marts, and all auctioneers having marts in the towns from which returns of prices are made are also to make returns to the Board of Agriculture. The section of the Act relating to auctioneers came into effect on January 1 of this year.

One other recommendation made by the Royal Commission may be said to specially affect agriculture, and therefore calls for brief mention in this article. This was the twenty-fifth recommendation, which ran:—

> That it is desirable to collect statistics of market prices of commodities, through the agency of market owners, as far as may be possible.

As regards grain and live stock, certain machinery now exists for the collection of prices. In reference to the former, it may be mentioned that at the beginning of February the responsibility for the issue of the weekly corn returns was transferred from the Board of Trade to the Board of Agriculture. But the twenty-fifth recommendation of the Commission had reference to produce other than corn and cattle—such, for instance, as cheese, butter, vegetables, meat, fish, &c. The statistical and commercial advantages of a reliable record of prices are practically the same in reference to every consumable commodity. As yet no steps have been taken to give effect to this recommendation, and no doubt it is a rather difficult problem to solve; but we may hope that, before long, farmers will be placed in a position to know with practical certainty what are the real prices current in the markets of the country for everything which they produce.

R. Henry Rew.

Official Reports.

ANNUAL REPORT OF THE ROYAL VETERINARY COLLEGE

On Investigations carried on for the Royal Agricultural Society during the year 1891.

Some very important work has been done in the Laboratory of Comparative Pathology during the past year. In addition to the inquiries which have been undertaken for members of the veterinary profession who have forwarded morbid specimens from various parts of the country, there have been special investigations carried on in reference to foot-rot in sheep; the effects of the consumption of meat and milk, both raw and cooked, of tuberculous animals; the value of Koch's fluid (Tuberculine); the detection of tuberculosis in cattle; and the life-history of the lung-worm affecting cattle and sheep.

It is not possible in the space available for this Report to deal with the several subjects of inquiry in detail, but a short statement of the results which have been obtained will be interesting.

Foot-rot in Sheep.

Much has already been written on this subject in veterinary works and in agricultural journals; but no conclusion has been arrived at which is generally accepted as to the nature of the disease. Many farmers entertain a firm conviction that it is the most contagious of animal diseases, while others dissent from the contagious theory entirely. The fact of several distinct diseases of the foot of the sheep being included in the term foot-rot has already been insisted on in explanation of the difference of opinion which exists, but it was demonstrated beyond doubt by the experiments which were conducted at the College in 1867–8 that foot-rot is capable of being conveyed from diseased to healthy sheep by merely rubbing the matter from a diseased foot into the skin between the divided hoofs.

Experiments on a large scale were carried on during the past year at the College, and also under more natural conditions at Harrow and Denham. It may be stated at once that the results

confirm those which had already been arrived at from the previous experiments at the College as to the contagious nature of the disease, and what is of more importance, tend to support the belief which is entertained by many practical men that ordinary causes, such as injury to the foot, or long contact with wet land, will not induce the disease without the intervention of a diseased animal.

Experiments at Harrow were commenced with two ewes affected with foot disease which was considered by the owner to be the true contagious form of foot-rot. The animals were presented by Mr. Charles Whitehead, of Maidstone. With the diseased ewes there were penned, in the first week of April, some Welsh sheep and some tegs from Berkshire, all of them, so far as could be ascertained, free from any suspicion of foot-rot. Other sheep from the same flocks were penned on the opposite side of the same pasture, away from possible risk of contact with the diseased sheep.

During April and part of May no rain fell, and the sound sheep remained sound. But on June 2, after some heavy showers, the sheep in contact with the Kentish ewes began to suffer from foot-rot of the characteristic kind. The sheep on the opposite side of the meadow under the same climatic conditions remained sound. On September 2 these sheep were still free from any trace of disease. Three of them were then moved to the other side of the meadow and put into a pen from which several diseased sheep had been removed two days previously, and on September 19 one of them was the subject of foot-rot and the rest followed in succession. A Cotswold wether and a cross-bred lamb from Gloucestershire, which had been kept on a wet meadow at Denham for several months without showing any sign of foot disease, were brought to Harrow, and placed on a pasture with some of the diseased sheep on September 19, and both of them became diseased, the lamb on October 9, and the wether on October 11. Meanwhile one of the Welsh sheep which was still left in the pen on the side of the meadow away from the diseased sheep remained healthy at the end of the year, although it had been standing for weeks over its fetlocks in mud and manure.

At Denham the experiments which were carried on at the same time as those at Harrow were attended with equally definite results. An extensive outbreak of foot-rot among newly-purchased sheep on the farm afforded an exceptional opportunity of conducting an inquiry, as the owner of the flock was himself interested in the question, and competent to superintend the experiments.

Ten sound sheep, five tegs and five lambs, were obtained from a farm on the Cotswolds which had a reputation of having been always free from foot-rot. Three tegs and three lambs were penned as test cases in a wet meadow, bounded on three sides by a river, a pasture in which sheep were never put.

The remaining wethers and lambs were divided and put with diseased sheep on grass land and in pens with concrete floors which were swept and cleansed every day.

The experiments were commenced in the last week of June

During July, August, and September no results were observed from contact with the diseased sheep, nor from exposure to the wet land.

On September 17, a wether and lamb from the wet meadow, which had remained sound from June 22, were sent to Harrow and put with diseased sheep on September 19, and as previously stated, both became diseased in twenty and twenty-two days respectively after exposure to infection.

On October 6 one of the sound sheep, which had been kept with a diseased sheep since June 21, in a pen with concrete floor, had foot-rot, and in another similar pen a Cotswold lamb kept with a diseased lamb for the same time had foot-rot. The Cotswold wether and lamb which had been on the pastures with diseased sheep since June 22 were also affected on October 6. The Cotswold sheep which were in the water meadow remained free from disease up to the end of the year.

From these experiments the following conclusions may be drawn, and, at least for the time being, accepted :—

1. After a long period of exposure, foot-rot is communicable from diseased to healthy sheep by association on good dry pasture land, or in pens with hard floors kept clean. The period of exposure was three months in the pens and ten weeks on the dry pasture.
2. Sheep from a district in which foot-rot was unknown did not suffer from six months' exposure in a wet meadow. But the same sheep readily took the disease after being placed for a fortnight on a pasture with diseased sheep.
3. Sheep which were kept for several months on moist clay land, without showing any sign of foot-rot, took the disease in seven days when they were penned on the opposite side of the same meadow on a spot from which sheep affected with foot-rot had grazed for some weeks, but had been moved therefrom two days before the sound sheep were placed there.
4. Infection is most probably due to the entrance of the matter from a diseased foot into the pores of the skin ; and the long period which elapses in many cases in dry weather before disease is developed is due to the condition of the skin preventing the entrance of the matter into the follicles.
5. When all the conditions are favourable, and the skin is relaxed, and the openings of the follicles are free, the disease may appear in a few days after exposure to infection.

One very important question arises out of the results of the experiments, as to the state of the system of the affected animals ; symptoms of fever are apparent during the course of the disease, as a distinct rise in the internal temperature proves ; further, it is noticeable that the local affection often subsides in one foot, and becomes evident in another, and it is also a fact that a certain time elapses after inoculation or exposure in any manner to infection before the disease is declared. Experiments to test this and other doubtful points will be commenced at once.

Diseased feet from sheep which were killed while suffering from foot-rot in various stage were examined in the bacteriological laboratory.

In the early stage of the disease the skin between the digits or claws is chiefly affected, as was shown in the previous experiments. Fig. 1 illustrates the condition of the skin in this stage of the malady.

In the advanced form of the disease, which always proceeds downwards from the skin on the inside of the claw, the hoof is loose and ragged, and the surface of the membrane of the internal foot is covered with growths of a papillated form, as shown in the next figure (fig. 2).

A microscopical examination of the so-called fungoid mass proves it to be composed of horn cells loosely aggregated, mingled rotting material of all sorts, particles of manure, dirt of various kinds, numerous bacteria, and a few exudative cells. The occasional discovery of fungi (mould) and acari has no significance in relation to the causes or progress of the disease, save that, in common with other foreign bodies, they may help to maintain the irritation.

FIG. 1.—Early stage of Foot-rot
a. Eruption on skin between the claws.

Numerous micro-organisms have been cultivated from the matter discharged by the diseased surface, and further experiments will be made to ascertain whether they possess any infective power.

The illustration, Fig. 3, shows the appearance of a minute portion of fungoid matter from a diseased foot magnified 600 diameters.

The cure and prevention of foot-rot demand close attention to details. Admitting that foot-rot is the consequence of the introduction of diseased sheep, as the recent experiments seem to suggest, the avoidance of this cause is the obvious method of escaping the disease. But even under such circumstances the feet must be examined from time to time, otherwise damage to the hoof horn will

be followed by disease, which, whether it is called foot-rot or not, will be associated with a rotten condition of the foot.

In the early stage of the disease the cure is easy, and with proper care it may always be treated in this stage after the loose horn has been properly trimmed. A two per cent. solution of corrosive sublimate is a very good remedy in slight cases, the only objection to the use of the agent being its poisonous properties. Carbolic acid, one in fifty of water, is safe and effective, and may be used for

FIG. 2.—Inside view of one Digit, showing Advanced Stage of Foot-rot. *a.* Loose and broken hoof. *b.* Papillated growths (fungoid granulation).

a flock by the aid of a large trough containing a sufficient quantity to allow the animals to be driven through it.

Various other remedies are used, but the whole subject will be dealt with more in detail in a special article.

Experiments as to Communicability of Tuberculosis.

Feeding experiments to test the infectivity of meat and milk from tuberculous cattle, such meat and milk being apparently of good quality and free from tubercle bacilli, were attended with unex-

pected and positive results. A large proportion of the guinea-pigs fed on raw meat were affected with general tuberculosis.

Tuberculous organs boiled for thirty minutes, and some specimens which were made into sausages and fried in the ordinary way, produced tubercle. But specimens of tuberculous lungs and liver which were sliced into portions two inches square and half an inch

FIG. 3.—Scraping from Fungoid Growths. *a.* Horn cells. *b.* Micro-organisms.

thick and put into cold water, raised to the boiling point, and kept boiling for fifteen minutes, proved to be harmless to a number of guinea-pigs which were fed on them.

EXPERIMENTS WITH KOCH'S TUBERCULINE.

Koch's fluid (tuberculine) was tested on cattle, horses, and swine for the purpose of ascertaining its value as a means of detecting tubercle; the experiments did not, however, lead to any satisfactory result, as animals which, on post-mortem examination, were found to be free from tubercle, suffered a reaction as decided after injection as those in which advanced tubercle was detected after death.

Life-history of the Lung Worm.

Investigations into the life-history of the lung worm were carried on during the greater part of the year. Some lambs which were lambed in infected pastures were kept under observation, and some of them were killed at intervals of one to six months, but the animals were either found to be quite free from any trace of the worms, or had the adult parasites in the tubes of the lung. No instance has yet been met with in which the worms were becoming developed from the embryos.

Inquiries into Outbreaks of Disease among Farm Stock.

Congenital Goitre in Lambs.—A visit was made to Yorkshire in March last on account of a fatal disease prevailing in a flock of lambs, the produce of a small lot of Masham ewes purchased in the preceding autumn. It appeared that in the previous autumn a small lot of Masham ewes were purchased and added to the breeding flock, the whole being kept through the winter and spring under precisely the same conditions. Inquiry into the system of feeding and general management of the ewe flock brought to light no cause inimical to health. The disease was confined to the produce of the newly-purchased stock, and presented itself in the form of a large swelling extending over the front and sides of the throat. In every instance the enlargement was present at birth. Twenty-seven lambs in all were affected, and out of these twenty-two died. Some succumbed shortly after birth, and five of the number were still alive at the time of visit. In all of them, however, the enlargement had much subsided. Examination of the throat showed the thyroid gland to be considerably enlarged, and the death of the twenty-two animals would appear to have resulted from suffocation arising out of pressure of this swollen organ on the trachea and larynx. The ewes themselves were free from disease and had not suffered from any ailment during the winter. One of the lambs still surviving was sent to the College and kept under observation for several months, during which time the throat enlargement gradually diminished, but did not altogether disappear. The general health of the lamb, however, continued good. In October last inquiry was made as to the state of the lambs which recovered, and also as to their dams, and both were reported to have continued in good health. Two or three of the lambs had then been sold fat, and the other lamb was in good health. The lamb received at the College was destroyed on October 27. On post-mortem examination the thyroid gland was found to be somewhat enlarged, but all the other organs of the body were healthy. Heredity appeared to be the only assignable reason for the disease.

Abortion in Cattle.—In September last a request was made by a member of the Society for an inquiry into an outbreak of abortion

in Yorkshire, on account of which two visits were made to the farm. The disease occurred in a small herd chiefly composed of pedigree Shorthorns.

The first case appeared in October 1888 in an Irish heifer recently purchased. Nothing further happened until 1889, when in February a second case appeared, and from that time the disease continued to prevail up to the day of the visit. During the three years embraced in the inquiry, thirty-five cows have been pregnant, and of this number nineteen, or over fifty-four per cent., have aborted. Of the nineteen mishaps, three occurred in 1889, two in 1890, and fourteen in 1891. The prevalence of the disease during the three years is shown in the following table:—

Table showing the Number of Abortions occurring in each month during the Years 1889–91.

—	1889	1890	1891	Total
January	—	—	—	—
February	1	—	1	2
March	1	—	2	3
April	1	—	2	3
May	—	1	1	2
June	—	—	1	1
July	—	—	—	—
August	—	—	1	1
September	—	1	4	5
October	—	—	1	1
November	—	—	—	—
December	—	—	1	1
Total	3	2	14	19

Twelve bulls have been used in the herd since March 1889; abortion has followed the use of eight of them. During each of the three years while the disease prevailed on the farm in question cows belonging to neighbouring farmers were repeatedly being brought to one or other of the several bulls; and notwithstanding that no special measures of protection were resorted to, no extension of the disease to neighbouring herds took place in any case.

Age does not appear to have exercised any material influence over the disorder, for it was found that animals at all periods of life, from two to ten years old, were victims of the mishap. If we divide them into groups, taking those from two to five years old and comparing the incidence of the disease as it occurred in others from six to ten years, the relative prevalence of the disorder in the two sets of animals is as 55 to 33 per cent. It has, however, to be remembered that the herd was made up largely of young stock, and consequently a greater number between the ages of two and five were exposed to the inducing cause. Had the numbers in the two groups been equal, the percentage rate might have been different.

The stage of gestation when the mishap occurred varied very considerably in different cases, the longest being 38 weeks, and the shortest 16. Grouped in periods, we find that one aborted at 38 weeks, one at 36, four at 34, seven between the 26th and 29th week, and five between the 16th and 20th. Of the seven abortions between the 26th and 29th week, five occurred in the 28th week, which in this outbreak appears to have been the most susceptible period. Of the 19 calves aborted, 16 were dead and 3 alive. Two of the latter died four hours after birth, and one lived fourteen days. All were plump and well nourished. None were putrid.

The disorder was not confined to any particular place, but occurred both in the sheds and in the pastures. Up to the commencement of the outbreak and during its prevalence the general health of the herd had been good. Inquiry into the nature and quality of the food afforded no clue to the cause of the outbreak, and although in respect of some pastures objection might be taken to the quality of the water, this alone failed to account for the spread and continuance of the disorder.

Search was made for ergot, but none was found in any of the pastures. It was remarked that numbers of fowls overran two of the home fields, but it could not be said how far, if at all, fouling of the grass had contributed to the outbreak.

Glanders in Horses.—In October last an investigation was made into an outbreak of glanders in a stud of horses belonging to a farmer in Sussex. At the time of visit three animals were suffering from the disease, and have since been destroyed. Inquiry as to the cause of the outbreak led to the opinion that it had originated with animals on an adjoining farm, with which the horses in question had been brought into contact while at grass.

Outbreak amongst Breeding Sheep.—In November last an outbreak of disease in a flock of sheep was investigated in Lincolnshire. The malady presented itself in the form of an acute inflammation of the external genital organs, affecting both breeding ewes and rams. In the former the parts about the entrance to the vagina were much swollen, red, and painful, and in some instances studded over with a vesicular eruption. Thin dark scales followed the subsidence of the vesicles, and, in several cases, ulcerating sores continued for many days after the scabs had fallen away. The interior of the vagina was much inflamed along its whole length, and a slight discharge of pus and mucus flowed from it. The penis of the ram was very considerably swollen along a great portion of its length, and like the external parts of the ewes, was hot and painful to pressure. Blood in large quantities flowed from the sheath of the organ for ten or twelve days, and continued to be discharged in less amount for a further like period, when the swelling subsided and the hæmorrhage ceased. There was no constitutional disturbance attending the disease, and the local symptoms yielded to the administration of saline aperients and the application of mild astringents to the

diseased parts. The disease appeared suddenly after the removal of a ram from one lot of ewes to another, but inquiry failed to reveal the cause of the outbreak. No further cases occurred after the affected animals were removed from the flock.

Cattle, Sheep, and Swine admitted to the Royal Veterinary College for treatment in 1891.

During the year thirty-eight animals, including cows, calves, heifers, ewes, rams, lambs and swine were admitted to the College suffering from the following diseases: Tubercle, inflammation of lungs, parasites in lungs and in the digestive system, inflammation of intestines, foot-rot, and hereditary disease of the throat glands.

G. T. Brown, *Principal of the College.*

January, 1892.

QUARTERLY REPORT OF THE CHEMICAL COMMITTEE,

March 1892.

Several cases have occurred lately in which cotton-cake (both decorticated and undecorticated) has been found to contain a large amount of cotton-wool which has not been removed from the seed.

In one case, not here given in detail, three or four sheep were believed to have been killed by the use of such cake, and the vendors allowed a deduction of 20*s.* per ton in consequence. They stated, in justification, that they had received a very good analysis of the cake.

It should be pointed out, however, that the figures of an analysis, by themselves, cannot indicate the presence of an objectionable material of this kind; also that such a cake, though it cannot, in one sense, be called "impure" (inasmuch as it may be composed wholly of material derived from the cotton plant), may, nevertheless, be a dangerous one to use for feeding purposes.

The attention of Members is therefore specially called to this point, and they are advised in their purchases to stipulate that a cake shall be "pure and in good condition for feeding purposes."

If a cake be passed through a corn-mill and subsequently sieved, the purchaser can see for himself the amount of cotton-wool contained.

1. Mr. J. Maxwell, of 2 Victoria Place, Carlisle, sent on December 5, 1891, a sample of cotton-cake with the following letter:—

Dear Sir,—I enclose postal order 10*s*. for analysis of a sample of cotton-cake which I send by parcel post; it is Stead's (Liverpool) brand. It was fed to a number of fat cattle which were badly scoured the next day after getting it; the cattleman, not suspecting anything wrong with the cake, gave them an extra proportion of it that day to counteract the effects of the irritant from which they were suffering. But as the cattle were more purged than ever next day, I concluded the cotton-cake must be at fault, and stopped the use of it, with the desired result. The cattle are getting other cake and meals, but the cotton-cake was the only change they had in their food, which is my reason for blaming it for the trouble.—Yours truly,

J. Maxwell.

Dr. Voelcker's analysis of the cake was :—

	December 11, 1891.	
Moisture	13·75	100·00
Oil	3·63	
[1] Albuminous compounds (flesh-forming matters)	23·29	
Mucilage, sugar, and digestible fibre	32·92	
Woody fibre (cellulose)	21·06	
Mineral matter (ash)	5·35	
[1] Containing nitrogen	3·72	

Dr. Voelcker wrote as follows :—

Dear Sir,—The cotton-cake which you sent me I have examined, and enclose now the analysis. The latter shows it to be extremely low in oil. But this is not all: the cake is one which is full of cotton-wool. This has not been properly removed from the seed before the latter was crushed, and it is now distributed throughout the cake. The woody fibres can be seen running throughout it, and here and there are quite big pieces of cotton-wool. Besides this, the cake is not fresh, but is dark-coloured and stale. Such a cake is, in my opinion, a dangerous one to use for stock.—Yours faithfully,

J. Augustus Voelcker.

On December 31 Mr. Maxwell sent further samples, writing thus :—

Dear Sir,—*Re* cake No. 10. Mr. Stead was here yesterday and took samples of the remainder of the cotton-cake in dispute. His samples are to be submitted to brokers in Liverpool as referees; the samples I took (duplicates of the pieces he sampled) have been sent on to you to-day, carriage paid, and I will be glad to have your further report about them. Stead maintains they were not parties to the previous sampling, and will not recognise your analysis and report of the sample. I did not tell Mr. Stead that this sample would be sent to you, so will thank you to mark on your analysis the particulars of the seal on the parcel.—Yours truly,

J. Maxwell.

Dr. Voelcker's analysis was :—

	January 6, 1892.	
Moisture	13·40	100·00
Oil	4·80	
[1] Albuminous compounds (flesh-forming matters)	25·25	
Mucilage, sugar, and digestible fibre	30·90	
Woody fibre (cellulose)	20·16	
Mineral matter (ash)	5·49	
[1] Containing nitrogen	4·04	

J. Maxwell, Esq. January 6, 1892.

DEAR SIR,—I send you the analysis of an average sample taken from seven pieces of cotton-cake recently sent me by you, the parcel being sealed F. C. L. This analysis shows a better result than the one made for you on December 11, but the quality of the cake is still low. All the seven pieces of cake were very dark-coloured, and four of them particularly so. Not one of the pieces was fresh or nice, nor what good cotton-cake should be. All the seven pieces had more or less cotton-wool in them, and of three I would say that the extent to which this occurred was highly objectionable. In one cake a long piece of thin rope was found, and in others lumps of cotton-wool were dotted throughout.—Yours faithfully,

J. AUGUSTUS VOELCKER.

The following case shows how necessary it is, when purchasing rape-cake for feeding purposes, to stipulate that it be pure and fit for feeding :—

2. Mr. E. W. Singleton, of Preston Deanery, Northampton, sent on January 8, 1892, a sample of rape-cake, of which he had bought 3 tons at 4*l* 12*s*. 6*d*. per ton (and which was stated to contain from 9 to 10 per cent. of oil).

Dr. Voelcker reported upon the cake as follows :—

January 14, 1892.

Moisture	11·05	100·00
Oil	7·57	
[1] Albuminous compounds (flesh-forming matters)	31·75	
Mucilage, sugar, and digestible fibre	27·83	
Woody fibre (cellulose)	9·90	
[2] Mineral matter (ash)	11·90	
[1] Containing nitrogen	5·08	
[2] Including sand	4·85	

This cake is not only of poor quality, but it contains mustard-seed, and is therefore not fit to use for feeding purposes. Besides this it has nearly 5 per cent. of sand.

In correspondence it appeared that Mr. Singleton had written some few weeks before to ask about the best quality rape-cake for feeding purposes, and had received an analysis of some. Some time subsequently Mr. Singleton ordered three tons of rape-cake, but did not specially say that it was to be for feeding purposes.

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3. Mr. S. J. Knight, of Landens, Horley, Crawley, sent on December 7, 1891, a sample of what had been offered to him, at a low price, as "linseed-meal." The price quoted was 10*l*. 10*s*. per ton.

After analysis Dr. Voelcker sent the following report :—

December 14, 1891.

Moisture	9·80	100·00
Oil	8·50	
[1] Albuminous compounds (flesh-forming matters)	24·81	
Mucilage, sugar, and digestible fibre	35·79	
Woody fibre (cellulose)	7·40	
[2] Mineral matter (ash)	13·70	
[1] Containing nitrogen	3·97	
[2] Containing sand	7·50	

This is an adulterated meal, containing admixture of starchy material, and it has, besides, 7½ per cent. of sand. Linseed-meal ought to contain from 30 to 35 per cent. of oil; this sample has only 8½ per cent.

Mr. Knight fortunately had the analysis made before purchasing any of the meal.

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4. Mr. J. B. Ball, of High Offley Manor, Newport, Salop, forwarded on January 7, 1892, a sample of linseed-cake which he said had been guaranteed to him as "pure" and "to contain 12 to 13 per cent. of oil." Mr. Ball complained that his cattle did not eat it well, and that it was very gritty and bitter.

Dr. Voelcker reported on the cake as follows :—

January 13, 1892.

Moisture	12·75	100·00
Oil	11·56	
[1] Albuminous compounds (flesh-forming matters)	25·62	
Mucilage, sugar, and digestible fibre	33·64	
Woody fibre (cellulose)	8·33	
[2] Mineral matter (ash)	8·10	
[1] Containing nitrogen	4·10	
[2] Including sand	3·15	

This cake is a grossly adulterated one. In it I find quantities of rape and cockle seed; also seeds of spurrey, mustard, polygonum, hemp, *Camelina sativa*, &c. It has also over 3 per cent. of sand.

The cake was invoiced as "Linseed-cake," and two tons were purchased in October 1891, at 9*l.* 5*s.* per ton, carriage paid, for delivery in November.

In reply to Mr. Ball's complaint about the cake the vendors wrote :—

Dear Sir,—Yours to hand. We did not sell you E. K. linseed-cake. We sold you a 12-per-cent. cake made for us * * *, and it is a very good cake and good value. I shall see you on Monday at Newport.—Yours truly,
* * *
November 27, 1891.

The vendors ultimately allowed Mr. Ball 15*s.* per ton.

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5. Mr. C. Neale, of Kneeton, Nottingham, sent on January 7, 1892, a sample of linseed-cake for an opinion as to purity. Upon

Dr. Voelcker stating that it was not a pure cake, Mr. Neale had the full analysis made, with the following result :—

	February 4, 1892.	
Moisture	13·85	100·00
Oil	11·70	
[1] Albuminous compounds (flesh-forming matters)	30·91	
Mucilage, sugar, and digestible fibre	29·51	
Woody fibre (cellulose)	7·33	
[2] Mineral matter (ash)	6·70	
[1] Containing nitrogen	4·94	
[2] Including sand	2·10	

An impure cake, 'containing a quantity of rape-seed, as also spurrey, cockle, and other weed seeds, and with rather more sand than a pure cake should have.

A ton of this cake had been purchased as "pure linseed-cake," and cost 9*l.* 17*s.* 6*d.* per ton at Tuxford station, G.N.R. The vendor was Mr. John Martin, of Tuxford, Newark, agent for Messrs. Pearson Brothers, Gainsborough, Lincolnshire. Every cake was branded "Pearsons' 95% Pure."

When Mr. Neale told the vendor that the cake was not pure, he replied that it ought to be, for it was bought and sold as "pure linseed-cake."

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6. Mr. E. R. Pratt, of Ryston Hall, Downham, Norfolk, forwarded on January 23, 1892, a sample of linseed-cake for an opinion as to its purity.

It had been purchased as "Best Pure Linseed-cake (95 per cent.)," at 9*l.* 7*s.* 6*d.* per ton, delivered.

The cake being, in Dr. Voelcker's opinion, impure, Mr. Pratt wished the full analysis to be made, and the following was the result :—

	February 3, 1892.	
Moisture	13·50	100·00
Oil	9·00	
[1] Albuminous compounds (flesh-forming matters)	27·62	
Mucilage, sugar, and digestible fibre	36·38	
Woody fibre (cellulose)	8·00	
Mineral matter (ash)	5·50	
[1] Containing nitrogen	4·42	

The cake is neither best quality nor pure. It contains a good deal of foreign seeds, principally spurrey and rape, with starchy matter.

An allowance of 15*s.* per ton was made by the vendor, whose name, however, was not forthcoming.

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7. Mr. Jas. A. Gordon, of Arabella, Nigg station, Ross-shire, N.B., sent on January 23, 1892, a sample of linseed-cake for analysis. Twenty tons had been purchased on a guarantee that the cake should contain 10 to 11 per cent. of oil, and 32 to 35 per cent.

of albuminoids. The purchaser further stipulated that it should be "pure linseed-cake."

The vendor was Mr. J. M. Robertson, corn factor, &c., Invergordon, the price charged being 9*l.* 5*s.* per ton, carriage paid.

The following was Dr. Voelcker's report:—

February 3, 1892.

Moisture	9·95	100·00
Oil	9·56	
[1] Albuminous compounds (flesh-forming matters)	27·82	
Mucilage, sugar, and digestible fibre	35·81	
Woody fibre (cellulose)	8·76	
[2] Mineral matter (ash)	8·10	
[1] Containing nitrogen	4·45	
[2] Including sand	2·40	

An impure cake, containing spurrey and other weed seeds, and with too much sand. Its quality is considerably below the guarantee.

The vendor stated that it was "Riga" cake, but declined to say where he obtained it from, although he was willing to refund any deficiency.

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8. Mr. W. Biddell, The Hall, Lavenham, Suffolk, sent on January 30, 1892, a sample of rice-meal for analysis. Five tons of this had been purchased at 6*l.* a ton, on rail in London, from Messrs. Arthur Cole & Co., 61 Mark Lane, E.C.

Mr. Biddell on coming to use the meal found that his stock would not eat it, although they had always previously eaten rice-meal readily. Accordingly he sent a sample for analysis.

Dr. Voelcker analysed this, with the following results:—

February 5, 1892.

Moisture	6·90	100·00
Oil	7·04	
[1] Albuminous compounds (flesh-forming matters)	8·31	
Mucilage, sugar, and digestible fibre	40·86	
Woody fibre (cellulose)	3·58	
[2] Mineral matter (ash)	33·31	
[1] Containing nitrogen	1·33	
[2] Including sand	7·57	
" sulphate of lime	20·73	

This meal is grossly adulterated with grit, fine sand, and sulphate of lime. Besides this it is distinctly sour. It is not fit food to be given to stock.

From the correspondence, it appeared that Mr. Biddell had written to Messrs. Cole & Co., and had received on January 6 a sample of rice-meal quoted at 5*l.* 15*s.* per ton on rail.

The vendors stated that they expected a better sample at 6*l.* per ton in a day or two.

This latter sample was sent to Mr. Biddell, and on January 13 he ordered five tons of the better-quality meal.

On February 1 he telegraphed to the vendors :—

"Think meal had from you greatly adulterated ; will write in a few days."

The vendors replied :—

February 1, 1892.

DEAR SIR,—We are greatly surprised by your telegram, and cannot understand what can have given rise to it. We have seen the makers, but they say, in the absence of samples, they cannot throw any light upon it. Kindly send us samples, and tell us how many bags there are which are inferior to sample sold on, and oblige.—Yours faithfully,

ARTHUR COLE & Co.

Mr. Biddell sent a sample to the vendors as requested, and added that the meal had all been put in one heap together, the sample being drawn from this heap.

The vendors replied :—

February 3, 1892.

DEAR SIR,—We thank you for letter and samples. You have done quite right in sending a portion for analysis and we await result. As you are aware, we do not make rice-meal, but buy of importers and millers, and never see the bulk. The sample sent is apparently all right, and we can discover no smell in it which would set cattle against it. The maker is looking into the matter, but can get no light on it, beyond the fact that he was away on a journey for a week during the time this lot was made and delivered, and possibly a mistake was made then.—Yours faithfully,

ARTHUR COLE & Co.

The vendors took back all the meal which had not been used.

It is desirable to caution members against being misled by the statement that a manure is sold on a guaranteed analysis. All depends upon what the nature of the guarantee is.

9. A member of the Society sent on January 19 a sample of manure called "The Lecetic Fertiliser." In an accompanying circular the manure was stated to be manufactured by the Lecetic Manure Company, Northgate Mills, Newark-on-Trent, and the price of it was 3*l.* 10*s.* per ton, carriage paid.

The following *guaranteed* analysis was given :—

Calcium sulphate	71·00	100·00
Carbonate of lime	1·90	
Oxide of iron and alumina	5·50	
Organic matter, containing phosphates, ammonia, &c.	4·70	
Siliceous matter	3·62	
Sodium nitrate	0·70	
Potash	0·30	
Moisture	5·00	
Other matter	7·28	

Dr. Voelcker's analysis of the sample gave the following results :—

Moisture	1·70	
Water of combination	16·25	
Organic matter	4·95	
Sulphate of lime	61·33	
Oxide of iron and alumina	0·88	100·00
Magnesia, alkaline salts, &c.	7·02	
[1] Phosphoric acid	0·67	
Sand	7·20	
[1] Equal to phosphate of lime	1·470	
Total nitrogen	0·749	
Equal to ammonia	0·909	

It will be observed, on comparing the two results, that they do not show any very great divergence, and the manure might be considered as nearly coming up to the guarantee given.

It is necessary, however, to point out the misleading nature of the guarantee. It is one which really amounts to nothing, the phosphates and ammonia being grouped along with the organic matter, &c., whereas the results of Dr. Voelcker's analysis show these constituents to be present in but small quantity.

A manure containing so little fertilising matter as the sample examined is not worth a third of the price asked for it.

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10. *Adulteration of Manilla Hemp.*—It has been brought before the notice of the Committee that adulteration of Manilla hemp is being extensively practised, and that binder twine is being frequently sold under the name "Best Manilla," although it contains none or very little genuine Manilla fibre.

As the use of twine for sheaf-binding and similar purposes is likely to increase, purchasers are advised to be careful to obtain a guarantee of the twine being "Manilla fibre."

The Committee in conclusion would again impress on Members of the Society the extreme importance of stipulating with the vendors of feeding-stuffs for a written guarantee at the time of purchase, to be repeated on the invoice, that the feeding-stuff bought is pure, and will be delivered in good condition for feeding purposes.

March 1, 1892. EMLYN, *Chairman.*

QUARTERLY REPORT OF THE HONORARY CONSULTING ENTOMOLOGIST,

MARCH, 1892.

DURING the past three months there has been the customary amount of application, but until lately this has been mainly in continuation of observations of last season's attacks, or in the form of inquiry as to measures of timely prevention of attacks before spring developments.

Special inquiry has been made as to measures serviceable for prevention of attack of Wheat-bulb Maggot, which is the cause of serious yearly loss in many districts. This I drew attention to in my December report to the Society, and, in my Annual Report for the year 1891, I have given in detail the observations which point to the egg of the wheat-bulb fly (*Hylemyia coarctata*) being laid in summer or autumn on the fallow or exposed land, after which condition of land attack of wheat-bulb maggot is found to be most prevalent in the young wheat plants. Therefore measures, such as applications of chemical dressings, or ploughing with a skim coulter attached, or any treatment calculated to poison the young maggots in the surface soil, or to bury them well down, might be expected to be of use. Also, where the bulb maggot attack is of frequent recurrence the practice (adopted some years ago in a badly infested district) of not putting in wheat after bare fallow would not fail to be of service.

Some good might just possibly be done (in the time now approaching) by keeping careful watch on young wheat in fields where attack may be likely to occur, and at once applying some stimulating dressing. The mischief is caused by the small maggot feeding within one or more shoots (usually the centre or strongest shoot) ; usually, also, the damage is not observed, or at least reported, until April or May, when the whole field is markedly infested and past hope. If, instead, the attack was taken early, and some such chemical dressing applied (suitable to the nature and condition of the soil) as would push on growth, this would be very likely to help on the weak plants, or cause the others to tiller in time to give an even crop. A mixture of guano and salt sometimes answers exceedingly well in corn insect attack.

Additional reports of the results of the summer attack of Diamond-back-Moth were sent in answer to my inquiries from a few selected localities at distances along the main area of attack up to January 3rd of the present year. These gave for the most part observations of the leafage on the attacked plants having been enormous (quite over-luxuriant) and the bulbs small, or smaller than they ought to have been, and in some instances the amount of injury had proved very serious. On December 23rd, Mr. James Swan, of Inverpeffer, Carnoustie, Forfar, who had observed the attack carefully from its commencement, summarised the very full details he placed in my hands in these words : "In fifty years' actual practice, the Diamond-back moth has hit the heaviest blow I have experienced."

The recent attack has certainly done a great deal of harm, but with regard to the future, though any forecast must of course be very uncertain, still, after going into all recent details and previous records as carefully as I could, it does not appear to me that we are likely to be troubled by a recurrence of such another bad attack of this infestation unless, as in last year, we have coincidence of similar meteorological conditions (*i.e.*, wind and weather influences) at the time, and also following on those of preceding months and coinciding, where the damage was worst, with the suitable condition of the turnips to receive attack.

Amongst fruit attacks, which are yearly requiring more attention from the extension of the fruit-growing industries, inquiries have been sent regarding WEEVIL BEETLES, which are sometimes a great cause of loss to raspberry growers; APPLE SAWFLY, another bad attack, regarding the winter condition of which I am now receiving information; and the BLACK CURRANT GALL MITE, an increasingly troublesome pest to bush-fruit growers. All of these attacks might be lessened by attention beforehand, and the first two most especially by attention to their winter condition in the ground.

The *Cecidomyia* larva, or red maggot, of the HOP-STRIG, is another attack regarding which communication has been made, and which also might be much lessened, if not prevented, if it were possible to apply to the surface of the hop-hills dressings or treatment which would destroy or disperse the maggots lying in the soil, so as not merely just to disturb and again lightly bury them.

On Saturday, February 20th (that is, almost immediately after the severely cold night of Tuesday, February 16th), I received specimens of DADDY LONG-LEGS grubs and caterpillars of the great YELLOW UNDERWING MOTH, which were then doing much mischief in a field of wheat near Stafford. This observation is worth notice as a further confirmation that cold is not to be relied upon as a means of clearing the grubs, that is as long as they are in their natural shelters; and with regard to the *Tipulæ* larvæ, *i.e.*, Daddy long-legs grubs, I have known them survive being frozen to a temperature of 10° below zero, that is 42° of frost.

I am sorry to report that the MEDITERRANEAN FLOUR-MOTH, the *Ephestia Kuhniella*, has been steadily establishing itself in this country. This little grey moth is not altogether unlike a clothes-moth in shape and size, and particularly infests wheat mills and stores, and the caterpillars, besides injury to the flour, do unbounded mischief by dispersing themselves in every part of the mill where flour can be found, and by their great powers of web-spinning they stop the flow of flour in the "spouts" and also injure the "silks." When once infestation is established, each mill is a centre for distribution of the pest to all places, near or far, to which the flour, or sacks which have held the infested flour, may be sent.

In previous reports I have described this attack with information as to such remedies as can be brought to bear, which are mainly—turning on steam at the highest temperature attainable; fumigation with sulphur (the amount of sulphur used being strictly regulated in order to avoid risk of injury to flour); also extreme cleanliness; and baking, or otherwise treating, sacks used for transmission of flour which is, or may be, infested, is an important precaution. The attack can be very much kept under, as is shown by the good results in Canada, where, on the outbreak of the pest at Toronto, the measures used here were adopted, only on a much more stringent scale; but with us, as the inquiries sent to myself are in business confidence, it is not in my power to give warning in the infested districts, and thus this mill pest spreads around, and not only amongst ourselves. I have recently heard from Dr. Lindeman, the agricultural

entomologist of Russia, of the first observation of this infestation in that country, in stores in Moscow, to which it had been demonstrably and beyond doubt transmitted from London. There, as in Canada, being at once taken under supervision, the infestation was stamped out, or kept in check, but here I am only able to offer suggestions, and to do the best I can under the circumstances. I have prepared an account of the nature of the attack, and of the remedies found serviceable, for distribution to such as may desire it.

A good deal of application is being sent from Ireland for information as to measures for prevention of warble attack.

Amongst the inquiries occasionally received from members regarding insect injuries to colonial produce, an important application has lately been made regarding a small beetle, which I am informed was first observed a few years ago in the Island of St. Vincent, and which is now spreading to others of the West India Islands, and is causing very serious injury to the sugar-cane. Specimens, both of the infested canes and of the insects, were forwarded to me from the Agricultural Society of Barbados, and, through the assistance of Canon Fowler, Hon. Sec. of the Entomological Society, I obtained identification of the beetle as being the *Xyleborus perforans*, of Wollaston (synonymous with the *Xyleborus affinis* of Eichhoff). This is a small brown beetle, only about the twelfth of an inch long, which bores into the cane, and from the effect of the number of these tunnels, and the feeding of the multitude of maggots which continue the borings, the destruction to the canes becomes a very serious matter. After consulting (in an interview) with Mr. Geo. Hughes (Consulting Chemist of the Barbados Agricultural Society) as to practical remedial measures, it appeared that cutting out and burning the infested canes, which the specimens sent showed to be absolutely swarming with maggots, would certainly get rid of an enormous quantity of (otherwise) coming mischief. Also, it appeared that measures for the destruction of infested cane rubbish, and also for spraying the canes with a mixture sold under the trade name of "anti-pest" (which I have knowledge of as being serviceable in checking sugar-cane attack in Mauritius) would be likely to do much good. I am giving the most careful attention (with the assistance of specialists) to this sugar-cane attack, as, though not exactly British, urgent application has been made to me by members of this Society. Moreover, as I find, besides the very bad beetle attack, other insects present, in one case highly beneficial, and in another highly injurious, I think that by co-operation with Mr. Hughes and Mr. d'Albuquerque, the Island Professor of Agriculture, we may together do much to check the evil.

ELEANOR A. ORMEROD.

February 26, 1892.

Notes, Communications, and Reviews.

THE WORLD'S PRODUCTION AND CONSUMPTION OF FOOD.

The food-supply of the near future in respect of that portion of the human family known as "bread-eaters"—a technical term which serves to distinguish them from others who, in different climates, subsist on rice, yams, fruit, the products of the chase, and so on, instead of on bread as it is known to us—forms the subject of an interesting pamphlet,[1] by Mr. C. Wood Davis. The author is a statistician well known in America, where his facts and conclusions have received a considerable amount of attention, such as has not at present been accorded to them in this country. The pamphlet, indeed, is a most important as well as a very striking one, if only its conclusions shall be borne out by events, which we are led to look for well within the limits of the century which is already drawing rapidly to its close. We have, consequently, not long to wait for the verification, or otherwise, of Mr. Wood Davis's predictions. Here is the opening paragraph, which is the key to what is afterwards worked out with considerable elaboration :—

"Since 1870 food has, relatively to population, been more abundant and procurable at a less expenditure of labour than at any time in the history of the race, and the absence of war and the abundance and cheapness of the means of subsistence have, among the industrial classes, stimulated marriage, with the result of unprecedented additions to the populations of European blood ; and the enthusiast, without overmuch reflection, has assumed that humanity was entering upon an age when neither war, want, nor scarcity would be known. It is, however, very questionable if this view of the situation is tenable, and investigations—begun some years since by the writer—the results of which are now embodied in tabulations of official data, as to the relative rates of increase of the consuming populations and the productive power (as shown by the acreage at the close of the seventh, eighth, and ninth decades) of the fields of the temperate zones render it more than doubtful as to any prolongation of this period of abundance and cheapness."

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[1] *A Compendium of the World's Food Production and Consumption.* By C. Wood Davis. Published by the Author, Goddard, Kansas, U.S.A.

In order to keep the scope of the subject well within reasonable limits, and to deal as little as may be with what is speculative, Mr. Davis does not extend the retrospect beyond 1870, or the prospect beyond 1910—that is, about a score of years on either side of the present time. Statistics, indeed, bearing on agriculture are not available or reliable earlier than 1870, and he wisely concludes that 1910 is as far ahead as we can safely venture to look. In reference to the first part of his thesis, the increase of population in those parts of the earth to which his argument refers, he proceeds to say—

"Under the designations of 'bread-eating populations' and 'bread-eaters' are included only the peoples of Europe, the United States, British America, the Cape regions of South Africa, Australasia, South America south of the tropics, and the colonial European populations of the islands and tropical regions, the geographical distribution having been as follows at the close of the last three decades"—

and gives three columns of statistics showing that population in these portions of the earth increased from 359,000,000 in 1870 to 400,000,000 in 1880, and again to 456,000,000 in 1890—being an aggregate increase of 27 per cent. in twenty years, and amounting to about treble the number of people there are in Great Britain.

During the same period of twenty years the net increase of area from which vegetable food is obtained is seen in the following table, quoted from Mr. Davis's pamphlet. It will be noticed that under "food staples" he enumerates the two great bread-yielding cereals—wheat and rye—also barley, oats, maize, &c., and potatoes. Animal food is not included, for vegetable food is chief and constant, and will remain so ; the supply of it in the world will be relative to the supply of bread, and it is consumed in addition to bread. Should it become necessary to go on increasing the area of land devoted to grain-raising—increasing it constantly and rapidly, as now—stock-raising must diminish in course of time, and other countries, besides Japan, where animal food and even dairy products are not eaten, will learn the art of successful agriculture without cattle, sheep, and pigs :—

THE WORLD'S AREA IN FOOD STAPLES.

Products	1870	1880	1890	20 years' increase and decrease in acres	20 years' increase and decrease per cent.
	Acres	Acres	Acres		
Wheat . .	153,362,000	177,310,000	181,474,000	28,112,000 [1]	11·8 [1]
Rye . . .	109,076,000	108,345,000	108,364,000	712,000 [2]	·7 [2]
Barley . .	45,386,000	43,480,000	44,650,000	736,000 [2]	1·6 [2]
Oats . .	78,700,000	90,903,000	104,888,000	26,188,000 [1]	33·3 [1]
Maize, etc.	84,178,000	110,377,000	127,832,000	43,654,000 [1]	52·0 [1]
Potatoes .	21,765,000	23,616,000	25,839,000	4,074,000 [1]	18·7 [1]
Total . .	492,467,000	554,031,000	593,047,000	100,580,000 [3]	20·4 [3]

[1] Indicates increase and [2] decrease. [3] Net increase.

These figures exhibit "an increase of 20·4 per cent. in the aggregate acreage of all food staples, as against an increase of 27 per cent. in the bread-eating populations," but, "taking into consideration only the two principal bread-making grains—wheat and rye—the increase has been but 10·4 per cent., from which it appears that during the twenty years the bread-eaters have increased more than two-and-a-half times as fast as the material from which bread is made." From 1870 to 1880 the acreage of wheat increased 15·6 per cent. against an increase of population of 11·4 per cent., the result being an abnormal production of wheat, "a part of which was consumed to make up for the diminishing production of rye, and the remainder accumulated as a reserve which has sufficed to tide over later years, when both acreage and current production have been less than current needs." Also, "during the earlier years of the ninth decade the acreage in food staples continued to increase more rapidly than population, although the rate of such increase was progressively lessening," and about 1885 fell behind the population rate of increase, which rose from 11·4 per cent. in the eighth decade to 14 per cent. in the ninth. This position of the subject is well observed in the following table :—

Year	Bread-eating population	Increase per cent.	World's area in food staples	Aggregate increase in acres	Increase per cent.	Acreage quota per capita
1870 . .	359,000,000	—	492,467,000	—	—	1·37
1880 . .	400,000,000	11·4	554,031,000	61,564,000	12·5	1·39
1890 . .	456,000,000	14·0	593,047,000	39,016,000	7·0	1·30
20 years' increase	—	27·0	—	100,580,000	20·4	–

It will now be perceived that, as the percentage increase in acreage was one-tenth greater than that of population during the eighth decade of the century, agricultural depression was unavoidable; but it was postponed several years in Great Britain, while the inflation caused by the Franco-German War was evaporating. The researches which Mr. Davis has made have convinced him that the tide has turned, for he goes on to say :—

"During the ninth decade, on the contrary, population increased at a rate double that obtaining as to acreage in food staples, the result now being an ascending scale of prices for farm products, an advance in land values, coming scarcity, and a very brisk demand for farm products."

"A most significant fact, made very clear by the foregoing table, is that with a seventh more people to feed the increase in the acreage devoted to food production, during the ninth decade, was but a little more than half what it was in the eighth, when to have kept pace with the increase in population it should have been 36 per cent. greater, and there can be no reasonable doubt that but for the acreage in excess of current needs, existing at the beginning of the ninth decade, the pinch of scarcity would long since have been felt."

"It is equally significant that the United States has contributed such a very large proportion, too, of all recent additions to the world's food-producing areas, the extent and proportions of such contributions being made clear in the subjoined table, where is shown the aggregate of all such additions, the number of acres contributed by the United States, and the percentage of the whole so contributed :—

Year	World's area in food staples	Total acres added to area in food staples	Acres contributed by United States	Percentage contributed by United States
1870 . . .	492,467,000	—	—	—
1880 . . .	554,031,000	61,564,000	52,189,000	84·7
1890 . . .	593,047,000	39,016,000	29,945,000	77·0
20 yrs. increase	—	100,580,000	82,134,000	81·7

"This and the preceding tables show that during the last twenty years the consuming population has increased one-third faster than the products to be consumed, but this disproportionate increase has all occurred in the ninth decade (and the greater part of it within the last five years), as in the eighth decade the increase in acreage was 12·5 per cent. as against an increase in population of 11·4 per cent., while in the ninth the proportions have been an increase of 14 per cent. in the consuming element and but 7 per cent. in the area devoted to all food staples.

"Of the 100,580,000 acres added to the world's food-producing area, it is shown in the last table that no less than 82,000,000, or nearly 82 per cent., must be credited to the United States, and during the fifteen years ending with 1885 our additions were quite equal to the entire added requirements of the world. Since 1885, however, our additions to the area in staple crops have been less than half that required to meet the increasing needs of our own population, hence we have found it necessary to draw the needed supplies from the acreage heretofore employed in producing food for exportation, and the 21,000,000 acres so employed in 1885 have now been reduced, by augmenting domestic needs, to 10,000,000, and as we shall, at no remote day, require the entire product of our fields, we may well ask when will such conditions obtain, how will the world then fare for food, and whence can Europe hope to draw the needed supplies ?"

The most significant feature in the table last quoted is the marked falling-off in the addition which the United States has contributed to the increasing acreage devoted to raising bread-stuffs, viz. : from 52,189,000 acres in 1871–80 to 29,945,000 in 1881–90 ; and this falling-off was not made good by a corresponding increase in other countries, such increase being only some 9,000,000 acres. This serious check on the extension of cultivated area in the United States is reflected in the advance in the value of good land in that vast country which has taken place in the last two years, an advance amounting, according to another authority whom I have con-

sulted, in some of the Western States—as, for instance, Kansas—to some 20 or 25 per cent. It is believed that all the best land in the United States has been at length appropriated under definite individual or corporate ownership, and hence in part the reason for the increase of value in such land which has taken place. It must be understood that the area of "best land" in the States bears a small proportion to the whole of the vast area of the country, and that a great deal of inferior land is still available. There is, however, a large proportion of worthless land, in addition to "best" and "inferior," as will have been noticed by those whose lot, like my own, has been to travel over great distances, in various directions, in that country. We hear of many deserted farms in the Eastern States, but these are worn-out farms, consisting of land—of which kind there is a very large proportion all over the country—for the most part, which is pretty soon worn out under the farming methods which are in vogue, everything being sold off the farms and nothing bought on.

It has been the custom of some would-be authorities to declare, and consequently of other people to assume, that the vast plains lying "west of the 100th parallel [1]"—a favourite geographical expression—were for the most part fertile and adapted to cultivation. This bubble, however, has now been sufficiently pricked, for, as Mr. Davis says, "Successive armies of settlers have invaded these desiccated plains, but, after expending their means and suffering deplorable hardships, have found it necessary to abandon land and improvements. This is the area from which arises that perennial cry for aid, as it is also the land from which a refluent wave of population moves eastward with as much regularity as the return of Autumn."

It is nevertheless true that a large proportion of these plains is more or less fertile—or, rather, would be fertile but for the want of rain or of artificial irrigation. The great arid zone of the United States is no doubt potentially able to "bread the world," as I once heard an enthusiastic American express it, but, in order to realise this potentiality, water for irrigation is an absolute *sine quâ non.* These plains cover an area whose immensity is hardly realisable from figures, but their oceanic vastness and weird desolation, unrelieved by tree or mountain, are realised by those who have travelled therein. These boundless plains are understood, geographically speaking, to contain nearly one thousand million acres, or about thirty times the area of the whole of England! Here is what Mr. Davis says on the stupendous problem of irrigating these arid plains of Central North America :—

"Could water for irrigation be obtained, much of the plains region could be made productive ; but most of the streams penetrating it are even now yearly drained dry by irrigating canals, which supply water to irrigate but the smallest fraction of these immense areas. During the seasons of 1887, 1888, 1889, and 1890 (and nearly every year of late), many miles of such canals remained dry during the entire

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[1] This, of course, refers to the meridian of 100° West Longitude—a line passing through the States of Dakota, Nebraska, Kansas, and Texas.—Ed.

summer, owing to the complete appropriation of the water by canals opening from such streams nearer their source. In seasons of excessive drouth and deficient snowfall the water available is lessened one-half or more; hence irrigation from the water flowing in such streams has about reached its limit. This is notably true of the Platte, Arkansas, Cimarron, and Rio Grande.

"Many schemes have been proposed for utilising the water said to flow below the sand in the valleys, but such projects involve immense outlays, are as yet unfruitful, and, it is generally believed, will long remain so. Should such plans, however, ultimately prove successful, the resulting supply would suffice to irrigate but an inconsiderable fraction of the arid lands, being rarely applicable outside the immediate vicinity of the streams.

"The regions where irrigation is a condition precedent to successful agriculture include an area of some 784,000,000 acres, of which, owing to scarcity of water and lack of soil, not more than five per cent. is susceptible of cultivation; and there is no satisfactory evidence that water can be obtained to irrigate the half of five per cent. The construction of extensive irrigation works necessitates the expenditure of much money and takes long periods of time, and few of those now living will see the completion of such works as will be required to irrigate the 30,000,000 acres of arid lands which the Public Land Commission estimates as irrigable from existing supplies of water."

Irrigation works, on a scale at once costly and extensive, have been carried out in Utah, Wyoming, Colorado, and various other States within the arid belt, and, in these places, "water rights," with an adequate supply for the inevitable dry season of every year, are properly regarded as of more value than the land which is served by them, for without water the land is a literal Sahara in time of drouth. Such works are evidence of the growing scarcity of unoccupied land that, under any circumstances, may be fit for cultivation, for it may be safely assumed that men will not incur the labour and cost of making huge reservoirs, and an intricate network of canals, so long as there is land to be taken up that is fertile without these expensive preliminaries.

Further evidence which goes to prove the scarcity of unappropriated land worth having for cultivation is found in the thousands of would-be settlers who camp for weeks and even months, ready for a rush, on the borders of reservations which are expected to be declared open for settlement. This sort of thing occurs only in the United States, and, indeed, can only occur there at present, though in the future it may possibly do so in respect of Indian reservations in the North-West of Canada. Assuming the substantial approximation to correctness of Mr. Davis's statistics and arguments, it would seem extremely probable that American competition in feeding-stuffs has very nearly reached the limit of its expansion; and in this event, the importance of which is supreme in view of a population rapidly increasing, we may well pause to consider what the future has in store, and what will be the effect on British agri-

culture. It is assumed that the bread-eating population of the world will, to say the least, continue to increase about as fast in the current decade, and in the first decade of the twentieth century, as it did from 1880 to 1890, and in this event, this portion of the world's population will have reached 506,000,000 by the end of the current century, and 556,000,000 by the year 1910. Such being the case, it is estimated that no less than 136,000,000 acres of new crop-bearing land, not of low fertility, must be added to what the world already possesses, to provide food for extra mouths that must somehow be filled. This addition is much greater than that which was accomplished in the twenty years between 1869 and 1890, and the United States can provide only a rapidly diminishing portion of the land that will be required. The world, therefore, will have to look elsewhere for the food which hitherto the Americans have been able to spare, for Mr. Davis believes that, before the close of this century, the United States will be a food-importing rather than a food-exporting country. He believes, in fact, that by the year 1895 the turn of the tide will have set in.

The land still available in the States may possibly amount to nearly as much as the area which has been brought under cultivation in the last two decades, but this is an extremely liberal estimate; and, in any case, it consists chiefly of land of an inferior quality which has hitherto been passed over by settlers. It is believed that the increased production of food which will or may result from improved cultivation will do no more than make up for the lessening yield of remote districts, and that it will come too slowly to be of much use in relieving necessities which, if population continues to increase at the rate of the last twenty years, will soon become pressing. It must, however, be remembered that marriages decrease in number whenever food becomes scarce, and that an economical standard of living is by most people at once adopted. The following are the conclusions of Mr. Davis in respect of population in the United States:—

"At the close of the century population will probably have increased to 77,000,000, and, consumption continuing at the same rate per capita as now, we shall need the product of 243,000,000 acres; and with but 226,000,000 in cultivation, the necessity for the importation of food will long have been imperative.

"Ten years later it is estimated that population will have increased to 90,000,000, the area in cultivation to 234,000,000 acres, and the requirements to 284,000,000—the deficit reaching 50,000,000 acres, or 18 per cent., and necessitating the importation of nearly one-fifth the food and provender consumed, *or a proportionate lowering of the standard of living.*"

American competition has pressed heavily on the farmers of the British Islands during a long period, and particularly since 1877; it is, in fact, the only competition which they have seriously dreaded, and they have come to regard it as chronic and perpetual. During the last twelve years the profits of farming in these Islands have

been, chiefly in consequence of that competition, seriously reduced; in many cases becoming barely sufficient to afford subsistence, and in not a few vanishing altogether, until bankruptcy has supervened. At the same time it is true that the farmers of America have not been benefited by the keen competition which they have developed; rather have they suffered as much as, if not more than, their British contemporaries, and the expected reduction, or even extinction, of exports of American farm products will find a welcome in farming circles of the United States quite as warm as that it will meet with in this country. In prospect of the change, and in sympathy with it, the price of good farming land in America is already advancing, and I have found, even in Mexico, a general opinion to the effect that, in a short time hence, a great improvement will have taken place in the value of farm products and, consequently, in the value of land as well. There is room in the North-West of Canada for a great extension of cultivation, and in a few years' time we shall be drawing our supplies of wheat from this region rather than from the United States. If, however, the rapidly increasing population of the States shall during this century want feeding in part from other countries, it is from Canada that the food will chiefly come. In the event of Mr. Davis's predictions being verified, the farms of England, which now go "a-begging," will readily find tenants, and the heavy soils of Essex will be found to have derived an increase of fertility from fifteen or twenty years' rest.

I have said enough to show the importance of the publication under review, and much interest will probably be taken in closely watching the development of the predictions which it contains. These may or may not have a firm foundation in existing facts, and may or may not be verified; but at all events there is in the air, particularly on the other side of the Atlantic, a more or less definite belief that, before the close of the current century, the condition and prospects of farmers will have undergone a marked change for the better.

J. P. Sheldon.

SURGICAL TREATMENT OF THE LARCH DISEASE.

During a visit paid me in April 1891 by Mr. Carruthers—a visit chiefly devoted to the study of the larch disease—it was suggested that it might be worth while trying what surgical treatment would do to check or cure the evil. Accordingly some young trees were selected in a plantation that had been formed in 1887, where the disease had made itself very manifest. Trees were chosen in which the cankered spots were low down, as the lower the disease strikes a tree the more detrimental is it to its future value.

Firstly, the knife was used freely, care being taken to cut away,

at the spot operated upon, every scrap of bark that showed any sign of disease. The wound was next dressed with grafting wax, and then a bandage was placed over all. At the end of January 1892, the bandages were removed from two of the trees. It was very satisfactory to find that a clean healthy bark had formed over what last year was a cankered spot. Of course two cases are not enough to prove much, but I venture to think they go some way towards showing that young larches have vigour enough to stand surgical treatment, especially as in one case hardly any of the old bark was allowed to remain on, and that such treatment may save the life of the tree.

I have observed that, in some instances, the growth of the tree is so vigorous that it bursts off the bandages before the young skin is properly formed. This might be overcome by a little care in fastening on the bandage. In those places where the larch is an important tree, and where, as here (Sarsden, Oxon), the disease is prevalent, I would urge growers to try this experiment on a larger scale. It may enable the trees to grow into money, whereas, if it fails, and kills the trees, there will be fewer centres of infection.

MORETON.

CATTLE-WEIGHING STATISTICS.

ON November 25, 1891, the Board of Agriculture issued a Memorandum, No. $\frac{29}{1891}$, calling "the attention of the market authorities and others whom it may concern to the scope and requirements of the Markets and Fairs (Weighing of Cattle) Acts, 1887 and 1891."

It will not be out of place to give some consideration to this useful document and the circumstances which have led to its publication.

By the Act of 1887, market authorities, *i.e.* every company, corporation, and person authorised to take and taking tolls in respect of cattle in any market or fair, were required to provide and maintain sufficient and proper weighing accommodation.

In this Journal (Vol. XXV., second series, 1889, page 447), there will be found a statement of the commercial reasons and needs for such a statute. Its enactment has done much to encourage the use of the weighbridge, and without doubt has led to the general introduction of the latter. At the same time, as is usual in any interference with customs, rights, or prejudices, a corresponding amount of dogged resistance came into operation.

The authorities in some cases had among their members many who were directly interested in suppressing information or withstanding the application of a mechanical method of arriving at facts, which puts the inexperienced on better terms with the old practitioner, more particularly with the butcher, whose trade enables

him to continually test and correct his judgment by the actual testimony of the steelyard. So it came about that in many instances a perfunctory compliance with the new law was observed, and while machines were put down by the authorities, they were either in themselves of insufficient capacity or so situated as to make the use of them difficult and tedious. In some cases the evasion was obvious and ridiculous, as where nothing more was done than to supply some hurdles or other movable fence for the enclosure of a resisting and perhaps obstreperous beast on the platform machine previously erected in the market for weighing dry goods.

It was thus evidently requisite that the Act of 1887 should be amended, not only for trade purposes but for statistical purposes as well. By the Act of 1891, therefore, the departmental powers in connection with the law, originally vested in the Local Government Board, were transferred to the Board of Agriculture, whilst the market authorities, to which the Act of 1887 applies, unless exempted by order, were henceforth required to provide and maintain to the satisfaction of the Board sufficient and suitable accommodation for weighing cattle. Fourteen scheduled authorities in England, five in Scotland, and three in Ireland are required to send to the Board of Agriculture returns at such intervals and in such form and with such particulars as the Board, by order, prescribed, showing, so far as they can ascertain, the number of cattle entering, and the number and weight of cattle weighed at the market or fair, and the price of the cattle sold thereat.

There is an application also of the Act to auction marts and sales by auctioneers which provides for similar weighing and returns. Having in view, then, the importance of a due observance of the law and of their new duties in respect of it, the Board of Agriculture issued the Memorandum of November 25, 1891. Herein it is stated that the Board of Agriculture, "in determining the sufficiency and suitability of the accommodation for weighing cattle, will have regard to the following among other considerations, namely :—

"The convenience of the situation of the weighing machine to buyers and sellers.

"The supply of proper pens for keeping cattle together, both on entering and on leaving the machine.

"The size of the machine and its capacity for weighing at one and the same time, if required, a sufficient number of cattle, including store as well as fat stock, so as not to unduly delay the business of the market, fair, or auction."

There is also a useful suggestion that, in case of setting up new machines, it would be desirable to communicate beforehand with the Board as to the sufficiency of the proposed accommodation. Ere long, then, we may expect that the means will be afforded for the publication of reliable information as to the condition of trade in cattle among store as well as fat animals.

At present nothing can be more tantalising and unsatisfying than the statistics of his business provided for the British agriculturist. Their character and inutility are well illustrated by

reference to the transcripts made from them and published in the pages of this Journal.

The Tables are taken from official sources, but beyond giving the weekly gazetted prices of British corn per quarter, and the annual averages per quarter for ten years, together with the septennial average prices per bushel in relation to the tithe rent-charge, no information is furnished as to the value of British produce, excepting some prices of wool during six years calculated from the prices given weekly in the *Economist* newspaper. It is true that the number and value of live cattle, sheep, and swine imported into the United Kingdom are given with provoking particularity, and this favour is extended to bacon, beef, hams, mutton and pork brought from foreign parts into this country. These, too, are as far as they go reliable returns, for they are based on actual weighing, counting, and measuring.

Even foreign bones (burnt or not), hides, and seeds are found worthy of official entries in the Trade and Navigation Returns. As to the current values, however, of British store or fat cattle, sheep, or swine, there is no information whatever afforded, though no one would assert that the quantity and price of these articles do not affect British agricultural interests, and that accurate knowledge on that head is of the utmost value and importance to the owners and occupiers of the English soil.

The omission is annoying and prejudicial, but the reason of it is obvious. Until the passing of the Act of 1891 there existed no possible means of obtaining accurately the requisite information. A general indifference on the matter has prevailed, and, with an extraordinary carelessness or indolence, the agricultural world has been content to remain wholly in the dark, or to be occasionally illuminated by the paragraphs in the public press headed "Market Intelligence."

In view of the useful provisions to be found in the two weighing Acts, it is to be hoped that before the termination of this year some reliable information on the value of English store and fat cattle will be thus officially obtained from our markets and fairs.

Albert Pell.

BLOCK TESTS.

The public block tests that have been carried out in various parts of the kingdom clearly prove beyond doubt that "guessing" at the weight of carcass which a fat beast will yield is by far the most difficult operation in connection with the sale of fat cattle. There have been twelve of these block tests for farmers, but in many of these experiments butchers' and dealers' estimates have been included also.

The average diversity of opinion between the highest and

lowest guesses was (in stones of 14 lbs. each) 14 st. 5 lbs., or in money value 5*l.* 12*s.* 10½*d.*; but if the greatest diversity of opinion be taken, in one instance the difference was 31 st. 4 lbs., or in money value 12*l.* 15*s.* 6*d.*, and this in the case of a beast whose carcass weighed 56 st. 11 lbs.

There would of course be many good guesses, so that the above figures do not fairly represent the true knowledge of the farmers but it shows sufficiently the difficulty of the operation of guessing weights.

There have been two tests confined to butchers and dealers. In one of these, the butchers differed in their estimate of carcass weight to the extent of 17 st. 4 lbs., or in money value 7*l.* 1*s.* 2*d.* Now butchers may be called "educated guessers," as their business gives them the opportunity of practically testing their guesses every week. This is a still further confirmation of the great difficulty there is in arriving by a system of guessing at weights which represent quantity, and this affords conclusive evidence that this part of the business operations of marketing cattle should be done away with. It has also another incurable defect. This guesswork, which is mere speculative opinion, can never represent a fact, and consequently cannot be expressed by a figure, whereas it is absolutely necessary to obtain a figure in order that a true and reliable basis of calculation may be arrived at. This figure can only be got by taking the live weight as a basis of calculation, and without this no accurate accounts showing where profit or loss arises can be made out. In these days of intense competition created by free importations, it is absolutely necessary to set out such accounts.

A new feature in farming is thus presented which must be faced, for the old methods have not proved sufficient to meet the change in the times, and graziers have been steadily losing money. Other producing industries have had to meet the same severe competition, and of necessity have to rely entirely upon facts *as to cost*, and these facts are always represented by figures.

Having shown the difficulty of arriving at the carcass value of fat cattle by the present method of guessing, I will now show how easy it is to calculate the value of the carcass from the ascertained live weight.

There have been eight public tests of this kind where the live weight has been taken as a basis for calculation of the carcass weight, viz., by estimating the percentage of meat which a beast is likely to yield. This is the point where judgment or knowledge as to condition is required, but this knowledge is what farmers already possess, and a few tests will make them adepts. Taking the average of the eight tests, the difference between the highest and lowest estimates has only been 7 lbs., or, in money value, only 4*s.*—instead of 14 st. 5 lbs., or 5*l.* 12*s.* 10½*d.* in money value, where guessing was resorted to. These figures will, I think, show how very difficult and uncertain the process of guessing is, when weight and condition are considered together, without anything to guide the judgment. They will also show how easy the calculation becomes when the

most difficult part of the subject is disposed of by the use of the scales, and when the weight is ascertained beyond dispute. There may, of course, arise a little difference of opinion as to the exact percentage of carcass, but not much.

The foregoing deals only with the selling of fat stock. For graziers, the most important part of their business is the buying of store stock. If the cattle are to repay the grazier, their price should be regulated by the average price which beef is likely to fetch at the time the cattle are to be sold. For example, if bought in the autumn, they should be 1*s.* a live stone less than they are calculated to make when fat, and if bought in the spring, they should be 6*d.* a live stone less. Farmers have only to ascertain the weight of the stores they buy, and to keep a simple purchase and sale account, deducting from the total amount received the cost of any cake they use, and also any selling expenses incurred The account given below of the purchase and sale of sixteen Welsh Runts will make this matter clear.

Purchase Price
April 8, 1891

	£	*s.*	*d.*
16 Welsh Runts @ £17 each	272	0	0
Carriage from Harboro' @ 1*s.* 4$\frac{3}{4}$*d.* each . .	1	2	6
Commission @ 5*s.* each	4	0	0
	277	2	6

Cost per Stone
April 8, 1891

	£	*s.*	*d.*
Live weight of 16 Welsh Runts st. lbs. st. lbs. 1,253 0 = 78 4* each @ 4*s.* 5*d.** a stone	277	2	6

* These figures are absolutely essential to form a basis of calculation, and cannot be obtained by guessing.

Purchase Price
April 8, 1891

	£	*s.*	*d.*
16 Welsh Runts cost @ 4*s.* 5*d.* a stone . .	277	2	6

		st.	lbs.	
Wt. when	sold	1,608	12	mkt. wt.
„ „	bought	1,253	0	Fm. „
		16) 355	12	
Gain in live weight		22	3	each

Average percentage of carcass 58·88.

Price Realised
December 13, 1891

	£	*s.*	*d.*	£	*s.*	*d.*
Live weight of 16 Welsh Runts st. lbs. st. lbs. 1,608 12 = 100 7 each @ 4*s.* 11$\frac{1}{4}$*d.* a stone				396	6	8
Less cake @ 29*s.* each .	23	5	0	28	1	0
Less selling expenses . .	4	16	0			
				368	5	8
			Deduct cost =	277	2	6
			Gain =	91	3	2

	£	*s.*	*d.*	
16)	91	3	2	
	5	13	11	Gain on each.

Questions as to autumn or spring buying, the breed of cattle best suited to the land, and other details of this kind, must be left to the occupier, for no two farms are alike, and the price of stores will vary with supply and demand, as also with the seasons. By paying attention, however, to the cost per live stone, there will be a

reliable basis to calculate from. This figure, it will be found, is the main element which will govern profit or loss.

The above amount, 5*l.* 13*s.* 11*d.*, represents the gross gain per head of this one lot of cattle, which is above the average. From it will have to be deducted the farm expenditure, which is on an average about 3*l.* 18*s.* per acre, but taking the average of the whole of the cattle grazed in 1891 the gross gain was 5*l.* 7*s.* 6½*d.* Deducting from this the average farm expenditure, rent, rates and taxes, farm labour, &c., 3*l.* 18*s.*, leaves an average net gain per acre of 1*l.* 9*s.* 6½*d.* With this I am content. I do not expect to make more than 22*s.* or 23*s.* an acre on an average of years. The land feeds one beast to an acre, and I charge myself 2*l.* 10*s.* an acre for it. In 1891, stores were bought at about the proper price—profit or loss, as I have said, depends upon this.

I have lost money for four or five years in consequence of stores being bought too dear. The live-weight gain has been satisfactory, the cattle have dressed a good percentage of carcass, and I have sold them well, all by live weight, and at the top live-weight quotations of the day, or close upon them.

WESTLEY RICHARDS.

CLUN FOREST SHEEP

ALTHOUGH for many years Clun Forest mutton has been of high repute in the north-western counties, and has been recognised as of the choicest quality in the London markets, there has not hitherto been the showyard distinction of separate classes for the representation of the breed. This year, however, it appears in the list of specific breeds for which prizes are offered at the Warwick Meeting in June next. The breed has acquitted itself creditably in many showyards during recent years, and these successes, together with the fact that a fixity of type is being established, have entitled it to this recognition. The successes hitherto obtained have been gained when in competition with the Radnor Forest sheep, and other Forest breeds ; and the prize lists during the last fifteen or twenty years show a highly satisfactory record—the more so in that it has been a progressive one. In view of the probability of specimens of the Clun Forest breed of sheep being present in the Warwick Showyard, the following notes may prove of interest.

The value of the Clun Forest sheep is evidenced not only in its showyard successes, but in the circumstance that, together with the Radnor Forest sheep, it is very keenly sought after in a wide district beyond the distinctly Forest country in which it is raised. The ewes are now eagerly bought up at markets far from their original home, and the numbers of these which are disposed of for the purpose of producing lambs to be fattened out, and sold as early fat lamb, are sufficient to prove that the breed is highly valued.

At the annual fairs held at Knighton on September 13 and October 1, as many as 30,000 of these Forest sheep are annually pitched. At Craven Arms, Kington, and other places near the Forest district, large numbers are also sold during the autumn, whilst Messrs. Davies and Watkins, of Knighton, dispose of great numbers at all seasons. At other markets there is a constant sale, and, even so far north as Oswestry, Messrs. Whitfeld sell some 2,000 or 3,000 ewes weekly for several weeks in the autumn. The ewes, which invariably produce a large quantity of milk, and lambs are fattened together, and sheep farmers find them a profitable investment. The lambs, when got by a Shropshire ram, attain a rapid maturity, and those born early in January produce five stone of high-class lamb by Easter.

Considering the high estimation in which the Shropshire breed is justly held, it is perhaps only natural that any other breed existing in the same neighbourhood should be to some extent overshadowed, and, beyond this, the modern Forest sheep, when it leaves the strictly Forest districts, is indebted to the Shropshire sheep for aiding in its development and improvement. Accordingly, it is not surprising that so far as its merits as a sheep-feeder's breed are concerned, the Clun Forest breed is not widely known outside the districts where it is adopted, and doubtless many who see the Warwick Catalogue will feel that it is a breed of which they have heard but little. Clun Forest sheep possess no flock book. The development of the original native Forest sheep to the present type has extended over a lengthened period, and but little accurate record has been kept of the changes which have taken place, while the local traditions of the breed at the beginning of this century are both hazy and limited.

The Rev. Joseph Plymley, who wrote on the Agriculture of Shropshire for the Board of Agriculture in 1803, quoted from a previous report dealing with the Forest sheep, in which it was stated that the Longmynd sheep possessed horns and black faces, with wool averaging $2\frac{1}{2}$ lb. per fleece, of which $\frac{1}{2}$ lb. was breechen or coarse wool and was sold distinct from the rest. When fattened they weighed nearly 40 lb. Upon the hills nearer Wales (this would point to the Clun Forest) the flocks were without horns and had white faces.

Youatt, in 1837, confirmed this, but he stated definitely that the Clun Forest sheep were a white-faced, hornless breed ; though at the same time he mentions that they were fast changing their characteristics because of the crossing to which they were being subjected, and most of them bore traces of this in the darker colouring of the head. He gave, however, no reason why the Forest sheep of hills comparatively near together should have differed so widely in their outward points.

David Lowe, in *Domesticated Animals of the British Isles,* written also early in the century, distinguished the original Clun Forest sheep from those of the neighbouring Forests of Radnor and other high-lying Welsh counties, and had no hesitation in associating

them with the Ryeland sheep of Herefordshire, whence they had migrated apparently at some very distant period. Lowe treats the subject of the breeds of sheep of England in a masterly manner, and does not content himself merely with a narrow view of local breeds, but deals with them broadly from the naturalist's view, his section on sheep being a review of the breeds of the world. Hence, his opinion is most valuable, and the assertion that the breed is an offshoot from the Ryeland may be accepted with considerable confidence.

The Clun Forest breed has now been crossed with the Shropshire and the Radnor, which have themselves been crossed with other breeds, so that the distinctive white face has disappeared; but the fact of their having originated from the same stock as the Ryeland is a most important matter when considering the present characteristics of the breed. Previously, however, to discussing the modern points of the breeds of sheep in this part of the kingdom, it would be well to glance at the early history of the breeds of England in general.

Before the population of the country became dense, there were large tracts of uncleared Forest and Heath land, which carried a number of varieties or breeds of sheep, the differences between which were determined chiefly by the soil, the locality, and the elevation at which the land lay. It is not necessary here to enter into the characteristics of the sheep of the lower country and of the plains, where the soils were richer and where a quieter class of animals, producing longer wool and a greater proportion of fat, were found, though these have been called to the aid of many of the hill-country sheep-breeders to promote the production of animals with a greater aptitude to fatten. Nor need we consider the Heath sheep, because they have not influenced the breeds which took part in the moulding of that which is the subject of this paper.

So recently as the beginning of this century the poor hilly parts of Leicestershire, Staffordshire, Cheshire, Shropshire, &c., carried sheep which possessed the black or grey faces and legs, and the short wool, of the old horned Forest sheep; and these were of the same type as the sheep of the higher Welsh mountains to-day. It is believed that these breeds were the descendants of ancient sheep of South Britain, and that any variation was due to the causes we have mentioned, and not to interbreeding with any other breeds. The Radnor sheep of to-day is distinctly of the same origin as the sheep of the *higher* Welsh mountains, but the more favourable conditions under which they exist, together with the fact that they have been much intercrossed with other breeds, notably the Shropshire, may cause this feature to be overlooked by the casual observer. But by following the sheep from the higher lands through the lower and richer ones, the gradation in size and the similarity in the main features may be easily traced. Although some very faint resemblances may be found in the Radnors to the sheep of the *lower* Welsh mountains, they are indeed slight. The latter, the characteristic breed of Wales, possess white noses and lengthened hair under the chin, and are often spoken of as the soft-woolled breed, owing to

the softness of texture, although not absolute freedom from hairs, of the wool. These, too, have been subjected to a degree of crossing in some districts, but unless the crossing has been very frequently repeated the form and type are easily recognisable. An examination of the Clun Forest sheep will reveal very little that is traceable to them.

The Ryeland is a breed which, in discussing the history of the Clun Forest sheep, requires more consideration. This breed had many off-shoots, but the parent stock, or at any rate the higher-class animals of the breed, were found in the Ryeland district of Herefordshire, certain sandy tracks of land lying to the south of the Wye, which, in succession to the dense forests with which they were formerly covered, were for many years cultivated and frequently cropped with rye. This breed extended into Monmouthshire on the south, into Gloucestershire and Warwickshire on the east, and into Shropshire on the north. In the last-named county the most important of the local breeds which arose from the migration were the Clun Forest and the Shawbury. The Ryeland was a sheep of the poor land forests, which from time immemorial had covered parts of Herefordshire ; but, notwithstanding the unfavourable conditions by which it was surrounded, it only lacked one essential characteristic—that of size. The quality of the meat was excellent, and the wool unequalled by that of any other breed in Europe with the exception of the Merino. The fineness of the wool and the quality of the meat have not been impaired, even though so many crosses have been made, in the case of the Clun Forest sheep, and to day the Clun Forest stands out clearly as a sheep possessing exceedingly fine wool and yielding delicately flavoured meat.

The sheep now found in Radnorshire and the hilly parts of Shropshire bear a striking resemblance to the Shropshire sheep ; in fact, it is frequently stated that the Forest sheep have come to look like long-tailed Shropshires. Great improvement has been made by the crossing with the Shropshire sheep, the effect of which is more significant because, owing to the long, careful selection of the pedigree breed, it is prepotent, and the exterior is affected perhaps to a greater extent than is the interior of the animal. The wool is of fine quality, and the mutton equal to that of any breed. The wool on the hind-quarters is often mixed with long hairs, causing a "breechiness" which is considered a fault in other breeds, and in the most improved Forest sheep this characteristic is being bred out. The tail is long and broad, and the stoutness of the tail or breadth of dock is a point which breeders try to develop. Where only slight pains have been taken to improve the sheep, they are light in the fore-quarters, and the faces are either black, tan or fawn and white, grey, or mottled black and white. No purely white-faced Forest sheep remain in Clun Forest or its locality, as they have been much interbred with the dark-faced breeds of neighbouring districts.

The individuality of the Clun Forest breed is lost sight of to a very great extent, as the crossings have been so indiscriminate ; but there

is greater freedom from breechiness, while the lower setting of the rump and the heavier fore-quarters, which give the animal a greater squareness, have long been recognised, as is shown by a statement made by Mr. Henry Corbet, who wrote the Judges' report [1] on live stock at the Cardiff Meeting in 1872: "Within the memory of man the Radnor farmers have always gone to Clun Forest for their best rams." They continue to do so at the present time. Mr. Corbet further stated that "in the south-east districts of Radnor some improvement has been effected of late years through a sheep brought from Herefordshire—a mixture of the old Ryeland with Leicester and Cotswold." This would be a later introduction of the Ryeland blood than the one to which reference has been made, and would not refer to the Clun Forest district. Mr. J. A. Clarke, in his paper on "Practical Agriculture" in this Journal (Vol. XIV. s.s., 1878), does not mention the Ryeland blood when discussing the Forest sheep of Radnor, Brecon, Montgomery, and Monmouth, and, in fact, only mentions the Shropshires and Leicesters as breeds which have been used for crossing, these being comparatively modern crosses. Nor did he make the distinction between the Radnor Forest and the Clun Forest sheep, probably having in mind only the present popular view of the breeds, which classes them as one, but accords superior quality to the sheep of that portion of Shropshire in and around Clun Forest. As showing gradations of improvement in the wool, Lowe stated that the Clun Forest sheep produced a fleece weighing from 2 to 3 lbs.; Mr. Corbet in 1872 gave 4 to 5 lbs.; whilst at the present time, in the most improved flocks, the ewes give from 6 to 9 lbs., and the rams from 10 to 11 lbs. The improvement is largely due to the increase in size of the sheep as well as to the longer and thicker fleece. Lowe said the old Radnors weighed from 7 to 9 lbs. per quarter. Mr. Clarke stated that at from two to four years of age the Radnor sheep weighed from 14 to 15 lbs. per quarter; whereas, at the present time, a good wether at sixteen months may be expected to weigh from 16 to 18 lbs. or even 20 lbs. per quarter. These are great strides from the 5 or 6 lbs. per quarter of the sheep as found on the higher Welsh mountains, especially when it is remembered that these results have been obtained without sacrificing the quality of the meat.

As an instance of the method of effecting an improvement in the Radnor sheep, and of making it partake more of the Clun Forest character, it is worth mentioning that the ewes of the Cwmtither or Llanderig district are crossed with a good Clun, and the produce is again crossed with the Clun. The Cwmtither sheep are more truly of the old Forest type, being lighter in the fore-quarters than the Llanderig, therefore the latter is taken by preference. Various other districts carrying a good type of sheep are drawn upon for a supply of ewes, but though many breeds were at one time used to cross and improve the animals, the Shropshire is almost the only foreign breed which is now made use of. The alteration in type is required because

[1] See Journal, Vol. VIII. s.s. 1872.

the Forest land is much restricted, the larger portion having been broken up or enclosed, consequently the sheep have to lead different lives, and instead of roaming about for four or five years, picking up a scanty but not expensive living, they are kept a portion of their time on lowland, meadow, or arable land. This involves greater outlay, so that earlier maturity and greater size are found to be necessary.

From what has been said it will be inferred that the Radnor Forest and the Clun Forest breeds are much intermixed, but the Clun is the superior breed, because it was derived from a sheep which possessed exceptional qualities, and these the interbreeding which has taken place with the Radnor, since the comparatively recent curtailment of forest land, has been unable to deface. The Radnors, too, have been improved by the crosses of the crossbred animal which has resulted from the association of the two breeds. These have been further improved by other breeds ; the latest, and the one which is most clearly in evidence, being the Shropshire.

There is at present rather a want of unanimity between breeders as to some of the points which should be accepted as permanent standards to give the Clun Forest breed a fixity of type ; the chief one, perhaps, being as to the colour of the face. Some breeders of high-class animals advocate a black face, others a mottled face, while many prefer the tan or fawn-coloured face with an occasional white spot ; each group of advocates averring that sheep of the colour they champion are the best thrivers and the most profitable. The question will probably be settled by the extent to which the Shropshire sheep is called to aid in the further perfecting of the animal. Without venturing an opinion, it seems rational to suppose that, as the breed originally sprang from a pale-faced sheep, the tan and white may fairly be accepted, and it is certain that some of this colour are of splendid physique and are all-round good animals. This need not necessarily be held, however, for an illustration of the opposite ruling is shown in the case of the Hampshire Down breed, which on one side sprang from a white-faced breed, and results have fully justified its development into a black-faced sheep. On the other hand, the point to settle seems to be whether the Clun Forest breed shall retain its distinctly Forest type, or whether it shall be converted into a Down breed. If it retains its Forest type, it is not improbable that the tan and white will prevail.

A well-bred Clun Forest ram, as it now stands, is an imposing animal, and one which demands admiration from all who "possess an eye to a sheep." Granted the breed is a little unformed, or perhaps does not show the effect of the skill of the breed-maker, as do some of the older-established breeds, yet there is undoubtedly in it those characteristics which can be moulded by skilful hands into a sheep which would be hard to beat. The excellence of the meat and wool cannot be denied ; while the shapely well-covered head, with slightly Roman nose, the bold sçrag, and the free imperious step denote a robustness with which the breeder may take liberties in order to produce a more rapid maturity, without being afraid

of rendering it effeminate or weakly. The horns are being bred out.

It may be useful to add, for the information of readers who are not acquainted with the district, that the Hundred of Clun forms the South-West corner of Shropshire, being bordered on the South by Radnorshire, and on the West by Montgomeryshire. It was chiefly within this Hundred that the Forest district, which was named after the little town of Clun, and of which the small town of Newcastle-on-Clun was fairly central, was situated. The Forest district is now much curtailed, and is practically all enclosed; but at the beginning of the century there were 12,000 acres of common land, which were in an uncultivated state, affording pasturage to a large number of sheep. The greater part of this land lies at a high elevation, and the hills afford some of the most picturesque scenery in the county. The turf was good but variable, and the alternate hill and dale made the locality a typical sheep run. The grass-land in the valley of the Clun is equal almost to any in England, and the arable land adjoining is excellent. There is much red land in the district, though occasionally the clay soils are light coloured. The hills are generally of red sandstone, and in some places good building stone is quarried. The Clun Forest breed of sheep inhabited the Forest and common land, from which they took their name. The Radnor Forest sheep have been produced on the neighbouring Black Hills, and still have a great tendency to produce horns, and are somewhat smaller than the Clun Forest sheep and have darker-coloured faces. The Longmynd was an inferior indigenous breed with wide heads, black faces, narrow backs, and of poorer quality throughout.

Shropshire, with its many soils, its hills, and its forests, once possessed more varieties of sheep than any other county in the kingdom, or perhaps than any other tract of land of its size in e world. It has managed to meet the depression that has settled on the agricultural industry better than almost any other county, chiefly because of the excellence of its sheep, and particularly on account of the breed to which the county has given its name. The Shropshire breed has attained a world-wide repute, and certainly ranks high among the best. Nevertheless, in the Clun Forest sheep there appear to be all the essentials necessary to produce a breed which, if judiciously developed, cannot fail to add to the renown of a county which already occupies a leading place in the annals of sheep breeding.

W. J. Malden.

AGRICULTURE IN SOUTH AUSTRALIA.

In the latter part of 1890 I had occasion to spend three months in the Colony of South Australia, and a great part of the time was devoted to inspecting arable farms within a radius of fifty miles from Adelaide. Most of these farms were brought under cultivation within a few years of the foundation of the Colony in 1836, and the land was carefully selected for its fertility. In those early days, if the land was only tickled with a hoe, it was sure to laugh with a crop. Fifteen to forty bushels per acre of wheat were grown with no other tillage than a shallow ploughing. The crop was cut with the scythe, and threshed upon a level piece of ground by an implement like a huge butter-worker, a fluted cone of wood 10 feet long tapering from 2 feet 6 inches at one end to 6 inches in diameter at the other, fastened at its small end by a ring to a post and drawn round by horses attached to the other end. For many years the land yielded highly remunerative crops of wheat. Year after year, however, the same crop was repeated, the straw was burnt upon the ground, and no manure was applied to it: the inevitable result followed in a diminution of the yield, clearly perceptible through all the fluctuations produced by varying seasons and the occasional visitations of locusts and red rust. For the last nine-and-twenty years continuous wheat growing has been abandoned, and not less than one-half of the land has been left each year unploughed. A large portion of the wheat grown within easy carting distance of Adelaide has been cut green and converted into hay, and the proportion thus used has much increased within the last few years.

Although these changes for the better have delayed, they have not been sufficient to arrest, the process of exhaustion. The Government statistics for the whole Colony show that in the nine years, 1863–1871, the average yield of wheat per acre was 10 bushels 4 lbs.; in the ten years, 1872–1881, it was 8 bushels 23 lbs., and in the ten years, 1882–1891, it was 5 bushels 58 lbs. A considerable part of this falling-off in the average during the last decade is due to land being taken up by farmers in the north, beyond the line where the rainfall is reliable and sufficient for wheat growing; but apart from this there is no doubt that in the older settled districts, where the rainfall is usually sufficient, the wheat crop has of late years often been unprofitable.

To an English farmer it would appear almost impossible that in a country where wages are double what they are in England a crop of even ten bushels per acre could be grown and harvested with profit, much less one of barely six. It would be impossible if harvesting were attempted by any of the appliances used in other parts of the world.

Colonial ingenuity was very early directed to the construction of a machine that would gather in the harvest with the least possible expenditure of human labour. In the *Adelaide Observer*

of September 23, 1843, a model submitted to the Corn Exchange Committee by Mr. J. W. Bull, its inventor, is thus described : "His machine consisted of a long toothed comb fitted to a close-bodied cart, the teeth being operated on by four revolving beaters with square edges, which would have the effect of taking off the ears and depositing them in the body of the cart."

Mr. Bull had not capital enough to bring his invention into practical working, and several years elapsed before the present Ridley's stripper was brought out by the leading miller of the Colony, after whom it was named. It corresponds to the description given of Bull's model, but in action it differs from it in one very important respect. In the hot dry climate of Australia it was soon discovered that if the wheat is allowed to get dead ripe, the beaters, instead of taking off the heads, strip or thresh them, so that the grain alone falls into the so-called "body of the cart." As soon as the headland is reached the corn is shot out, to be at once threshed and sacked. In the absence of rats and rain it may remain there till it can be sent to market. A stripper worked by one man and four horses will clear ten acres a day. In all operations upon the farm human labour is economised as much as possible. Ploughing is usually done with three-furrow ploughs, one man driving six horses, generally yoked three-and-three.

A strict rotation of crops is nowhere pursued : the soil and climate are said to be too dry for any of our English clovers, but many of those who say so have never tried to grow them. During an inspection of more than 100 farms, I only remember to have seen one patch of red clover. It was growing luxuriantly upon good soil. The tenant reported that, once manured, it stands well for four or five years, and that he had been in the habit of growing it on his farm for fourteen years. Peas are the only leguminous crop commonly grown in rotation. Wherever they had been tried I found abundant evidence that a crop of peas was better than a bare fallow for the succeeding wheat crop.

Almost the only green crop commonly grown for horses and cows is lucerne, the deep roots of which enable it to stand in time of drought. The best farmers are gradually taking up the cultivation of other crops for dairy and grazing, such as maize, sorghum, holcus, millet, and mangel. These are chiefly grown in the vicinity of Adelaide, and in the hills where the rainfall is more abundant and where a stimulus has been given to dairying by the establishment of factories for butter and cheese. Such factories are mostly upon co-operative principles, and promise to be of great benefit to the country, although none of those that I visited had been established long enough to enable me to speak with certainty of their financial success.

It is in the growth of fruit trees, and especially of the vine, that most profit has been in late years made out of the land in South Australia. The similarity of the soil and climate to that of the south of France induced the colonists in early days to plant the vine and the olive, and both grew vigorously. The cultivation of

the olive is limited to a few individuals, who have been content to wait for the slow maturity of trees that have now come into full bearing and are yielding oil of the finest quality that fetches 10*s.* a gallon for consumption in this and the neighbouring colonies.

The quick return yielded by the vine made it much more popular than the slow-growing olive. It is grown freely in every garden, and at one time almost every farmer had his little vineyard and made his own wine. The grapes were easy to grow, and the wine was easy to make, but when made it excelled in nothing except in high alcoholic strength, due to the great sweetness of the grapes ripened under a sun that readily converts them into excellent sun-dried raisins. The wine being unsaleable was consumed at home, and it was soon discovered that the vineyard was not, under these circumstances, a desirable adjunct to a farm. While, however, in the majority of instances wine-making proved a failure, there were a few individuals who devoted themselves to the study of the subject, and obtained skilled *vignerons* from the wine countries of the old world. Instead of planting promiscuously the first cutting that came to hand, they selected the varieties that best suited the locality. The planting, rearing, and pruning of the vines, the pressing of the grapes, and the management of the cellars in which the crude wines were matured, were all conducted on approved principles. In course of time the character of the vintage became better known, a ready sale was obtained, and the grower began to purchase grapes from his neighbours. In this way there has arisen within the last few years in certain districts an increasing demand for grapes at prices varying from 3*l.* to 5*l.* a ton, and farmers who have no knowledge of the art of wine-making have been able to grow grapes at a handsome profit. At harvest time the grapes have merely to be picked, thrown into a cart, and carried to the wine-press.

At Belleview, Maclaren Vale, I found that an old flour mill had been converted by Messrs. Hardy & Sons into a winepress with cellars attached. They had planted 440 acres with vines, mostly quite young, and many of them not yet in bearing. In 1890 they made 75,000 gallons, and expected to make 100,000 in 1891 and 200,000 in 1892. They also bought large quantities of grapes from other growers. As an example of what may be done by an ordinary farmer, with no special knowledge or previous experience of vine growing, the manager mentioned the case of a neighbour who was lately struggling to pay the rent of his farm out of the return obtained from the sale of wheat and hay. Shortly before my visit they had paid him 320*l.* for grapes grown upon sixteen acres of his land, that he had with his own hand planted with vine cuttings. His yield averaged five tons an acre. This was considered to be a good but not an extraordinary crop. When rooted vines are planted they cost from 30*s.* to 40*s.* an acre per annum for cultivation during the first three years; in the fourth year the yield should cover the cost of labour, and a profit should be realised in the fifth year. There is every prospect that the area devoted to the vine and other fruits will rapidly increase in South Australia.

It is not likely that there will be any great increase in the growth of wheat. The table given below would rather show that, although South Australia remains, as she has always been, the chief wheat-producing colony on the Australian continent, yet with the increasing Australian demand for wheat, she must take in the future a smaller share than she has hitherto done in the supply of grain to the more distant markets of the world.

ACREAGE AND YIELD OF WHEAT IN SOUTH AUSTRALIA.

Year	Acres under crop	Bushels	Average bushels per acre	
			bush.	lbs.
1863	320,160	3,841,824	12	0
1864	335,758	4,691,919	14	0
1865	390,836	4,252,949	11	0
1866	410,608	3,587,800	8	0
1867	457,628	6,561,451	14	0
1868	550,456	2,579,894	4	40
1869	533,035	5,173,970	9	42
1870	532,135	3,052,320	5	45
1871	604,761	6,961,164	11	30
1872	692,508	3,967,079	5	44
1873	759,811	8,735,912	11	30
1874	784,784	6,178,816	7	52
1875	839,638	9,862,693	11	45
1876	898,820	10,739,834	11	57
1877	1,083,732	5,857,569	5	24
1878	1,163,646	9,034,692	7	46
1879	1,305,851	9,332,049	7	9
1880	1,458,096	14,260,964	9	47
1881	1,733,542	8,606,510	4	58
1882	1,768,781	8,087,000	4	34
1883	1,746,864	7,356,117	4	13
1884	1,846,151	14,649,230	7	56
1885	1,942,453	14,621,755	7	32
1886	1,630,000	5,161,666	3	10
1887	1,970,000	10,835,000	5	30
1888	1,950,000	19,012,500	9	45
1889	2,000,000	6,187,000	3	6
1890	1,824,961	14,577,358	7	55
1891	1,753,032	10,518,890	6	0

CHARLES GAY ROBERTS.

GLASSHOUSES.

A CASE[1] recently decided by Mr. Justice Kekewich illustrates the elasticity of the law, and shows how, much as it is often abused by laymen for its strictness and rigour, it can adapt itself to altered circumstances in matters relating to the cultivation of the soil.

[1] *Meux* v. *Cobley*, reported in *The Times* Law Reports, vol. viii. p. 173.

In January 1889 the plaintiff, Sir H. B. Meux, granted a lease of a farm, situated in the parishes of Cheshunt and Enfield in the counties of Hertford and Middlesex, to the defendant at a rent of 225*l.* a year. The farm contains about 152 acres, and is partly pasture and partly arable. The lease contained a covenant by the defendant, as is usual in farm leases, that he would in all respects cultivate and manage the farm "in a good, proper, and husbandlike manner according to the best rules of husbandry practised in the neighbourhood." The plaintiff's complaint against the defendant was that the defendant, without the plaintiff's consent, in 1889 erected on the arable land two glasshouses for the cultivation of tomatoes and other hothouse produce for the London Market, and that in 1890 he erected a third glasshouse for the same purpose, in spite of the remonstrances of the plaintiff's bailiff, and also that the defendant was intending to erect additional glasshouses. The plaintiff contended that the erection of these houses for the purposes mentioned constituted such a change in the mode of cultivation stipulated for in the lease as to amount to a breach of the above-quoted covenant, and that the conversion of the farm into a market garden was "waste," and would cause loss to the plaintiff, and throw an additional burden on the land. The defendant, on the other hand, contended that he had a right to erect the houses, and that they constituted an improvement to the farm, and to the inheritance of it; and further that the erection of the houses was authorised by the Agricultural Holdings Act, 1883, and that they were buildings which, having regard to the provisions of that Act, might be removed by the tenant at the expiration of the tenancy, or be bought by the landlord. Mr. Justice Kekewich, without deciding the last point, gave judgment for the defendant—the tenant—with costs against the plaintiff—the landlord.

The material part of his Lordship's judgment is reported as follows:—"It was to be observed that although this was a lease of a farm—an agricultural lease—yet there was no prohibitive covenant against the lessee doing the things complained of, and also that the lease contained no provision as to rotation of crops. Therefore the lessee was left at large to cultivate the land at his discretion, the only restriction on that discretion being, that he was to cultivate 'in a proper and husbandlike manner according to the best rules of husbandry practised in the neighbourhood'; and the lease also bound him to yield up at the end of the term in good condition not only the existing buildings, but all fixtures and other things attached to or set up on any part of the farm. So that the lease contemplated certain additions in the way of fixtures; also it was to be observed that anything of this kind done was to be done at the tenant's risk. He could not compel the landlord to take it or pay for it, so that after spending perhaps hundreds of pounds on the property, the tenant might be compelled to go out of possession without having received anything but a poor return for his expenditure, and possibly without getting anything back. Now what was the tenant doing which was not 'according to the best rules of

husbandry practised in the neighbourhood?' One must bear in mind the change of circumstances in the neighbourhood, and the mode of cultivation of land now adopted there. One must look and see what was going on in the neighbourhood, and not exclude the consideration which came within one's own extra-judicial knowledge that the wants of the Metropolis and the neighbourhood were constantly extending and necessitated the increase of market-gardens. Then there was the consideration that in the neighbourhood of this farm there were other market-gardens, and also other farms conducted on the principle which the defendant had adopted to his own advantage, namely, combining the farm proper with the market-garden proper. His Lordship could not see that this was not using the land 'according to the best rules of husbandry practised in the neighbourhood.' Construing the case according to the usages of mankind and the words of the lease, he saw no reason why the defendant should not erect such glasshouses as he thought fit. The defendant, in his Lordship's opinion, was entitled to use the ground as a market-garden, and if so, he was entitled to cover it with glass-houses, and derive advantage from it in that way. If that was expressly sanctioned by the lease, it could not be 'waste'; the tenant could not commit waste as against his landlord, if his landlord had by special contract given him leave to do so. Was what had been done 'waste?' Perhaps technically it was; but supposing it was, it did not follow that the plaintiff could recover damages for it, or obtain an injunction to prevent it. Was there any injury to the inheritance? The evidence showed that to be an absurdity; and that so far from the erection of these houses being an injury to the inheritance, it would be of advantage to the farm, the ground being in the neighbourhood of London.

"There was another point, as to the application of the Agricultural Holdings Act, 1883; but in the view which his Lordship took of the case it was not necessary to consider what the meaning of the Act was; but the Act appeared to go a long way towards getting rid of the old common-law doctrine of 'waste.' Without deciding the point, his Lordship felt inclined to hold that these houses were 'improvements' within the Act, that is to say 'improvements' for which a tenant might get compensation, but further than that he did not think it necessary to go."

S. B. L. Druce.

THE CURE OF SHEEP SCAB

In relating the history of the eradication of sheep scab in Australia, I may observe that my personal experience in the matter dates back to 1854. At the outset it may be well to remark that the idea that scab was eradicated in Australia by the slaughter of the scabbed sheep is entirely erroneous. As a matter of fact, scab

was completely exterminated in New South Wales, Victoria, South Australia, Tasmania, and New Zealand without the slaughter of a single sheep.

It is true that an Act was passed in New South Wales about 1851 compelling the slaughter of scabbed sheep, and a few remaining straggling flocks were destroyed under that Act ; but on the reappearance of scab in that Colony in 1863, by infection from Victoria, the Act was repealed, and the whole of the scabbed sheep, about 400,000, were completely cured by means of tobacco and sulphur, under the direction of Mr. Alexander Bruce, the present Chief Inspector of Stock for that Colony, and with whom I was then associated in the work. The whole number were cured in the space of eighteen months, and the cure would have been completed in less than a third of that time but for the failure of several individual owners, who used other medicaments besides tobacco and sulphur, but who were ultimately compelled to resort to the latter.

Up to 1856 various applications were in use in Australia, the principal being corrosive sublimate, arsenic, tobacco, and many patent specifics ; but although these, as well as others, might and did kill the Acarus, neither of them were preventive of further attack. It was found that the Scab Acarus attached itself to trees, fences, &c., and from these the sheep were again infected. Mr. John Rutherford of Victoria, whose name is revered by sheep owners throughout the whole of Australasia, conceived the idea that, if the skin and fleece could be thoroughly saturated with sulphur at the time of dipping, this material would adhere to the wool for a period longer than that during which the Acarus could live on fences, trees, and other objects with which the sheep had been in contact, and would thus prove a complete preventive. I need not say how thoroughly his idea has stood the ordeal of practical test. The tobacco and sulphur treatment thus became recognised by the various Governments as the only known effective cure, and by its means scab was speedily eradicated from South Australia and New South Wales. Queensland had previously been rendered free from scab, and by the same means.

Some years later the late Dr. Rowe, of Mount Battery Station, Victoria, an extensive sheep owner, introduced the use of lime and sulphur (apportioned as stated in the accompanying memoranda—page 165—of instructions issued by me), and it was found to be a thoroughly effectual cure and preventive. It is the cheapest of all specifics, and can be prepared by any labourer of ordinary intelligence, or, as is frequently done, by a boy. With this specific, scab was effectually banished from Tasmania and Victoria, and, as previously stated, without the death of a single sheep.

In 1885 a few rams arrived in Sydney from America, and as a precautionary measure were dressed three times in quarantine, at intervals, with Little's Sheep Dip. Scab had been lying latent in these sheep, and some time after their release from quarantine the disease broke out among them, and they were destroyed (and paid for) as the speediest means of stamping it out, but principally in defer-

ence to the request of the sheep owners of the Colony, among whom the outbreak had caused quite a panic. Little's Dip had been strongly recommended as a cure for scab, but, after this experience, that and all other dips, with the exception of tobacco and sulphur, and lime and sulphur, have been prohibited in all the Colonies.

Cooper's Dip is used in Queensland for destroying sheep ticks; but we have ample evidence to show that, in the conditions under which sheep are kept and pastured in Australia, it is a very unreliable cure for scab. I notice, by an official report from New Zealand, that it had failed in that Colony. When in Sydney at a conference in June, 1891, the Chief Inspector there and myself were interviewed by Dr. Brown, of Cape Colony, who solicited information as to the Australian scab cure, as Cooper's Dip had failed to eradicate the disease there. A letter from a sheep owner in Cape Colony states that some stud sheep from Queensland, shipped to that Colony, got scabbed at Mauritius, where they were landed *en route*, and that the same dip had failed to make a permanent cure. Against such testimony we have the undeniable fact that tobacco and sulphur, and lime and sulphur, prepared and applied as here directed, *have never failed*, and that, too, without the sheep being turned out of the infected paddocks after dipping. I do not say that Cooper's or any other dip does not kill the Acarus, and if the sheep can be turned into pasture where there is no chance of re-infection, the cure may be complete; but such conditions do not exist here.

We usually dressed the sheep twice at an interval of ten to fourteen days, on the assumption that although the dip killed the Acari, it might not destroy the undeveloped germs under the exterior cuticle; but since the proper application of the dips has become well understood in these Colonies, one thorough dressing effects a complete cure.

I am unable to recommend "pouring," or what in Australia is called "spotting," for scab. To ensure a cure the sheep *must be immersed* bodily in the dip, and the temperature of the bath maintained up to at least 80° F. (110° by preference).

As to the *effects of lime and sulphur on the wool* If the sheep are shorn before being dipped, the deterioration is infinitesimal—such, at least, is our experience. When dipped in full fleece the deterioration was computed by the wool buyers at only 17 per cent.; that is to say, when the average price of the wool of sound sheep was eighteenpence per pound, the dipping depreciated it to the extent of only *threepence per pound*. But what is that on *one year's clip* compared with the loss occasioned by scab?

Next, as to the relative cost of the dips. The cost of labour in actually dipping the sheep must be the same with all dips. Lime and sulphur is incomparably cheaper than Cooper's, McDougall's, Little's, Hayward's, Thomas's, or any other patent dip.

Flowers of sulphur can be bought in the Colonies duty free at 22*s*. per cwt., and lime is cheap enough in all countries. Tobacco leaf being extensively grown in the Colonies is also cheap,

but, when imported, manufactured tobacco is used. The latter is obtained free of duty by having it first rendered unfit for smoking by the application of tar or kerosine. Its cost is about 3*d.* per lb.

By means of an ordinary boiler, one man, or even a boy, can prepare in one hour sufficient of the mixture to dip a thousand sheep, or in other words the labour required to "make up" a lime and sulphur dip does not cost a farthing more than that involved in mixing a dip of Cooper's or any other specific, for I hold from long experience that fire must be used in the preparation of any sheep dip for scab. To be thoroughly effective *it must be applied hot.*

It is true more care is necessary in the preparation of the tobacco and sulphur dip, and solely for that reason the lime and sulphur dip is preferable. The cost of the lime and sulphur dip is one penny per gallon, and as the sheep after the dip stand on a floor which conducts all drainings from them back into the dip, the quantity of liquid carried away by each sheep is infinitesimal, so far as its money value is concerned.

Our Australian experience of tobacco and sulphur, and of lime and sulphur, as the only effectual means of curing scab is such that at the Stock Conference held in Sydney in 1886, and again in Melbourne in 1889, attended by the chief inspectors and Government veterinarians of all the Colonies, it was on both occasions decided that none but these two dips be recognised by the Colonies, and this has now been embodied in regulations under the "Stock Diseases Acts" of all the Colonies.

The stamping out of scab in these Colonies has been more retarded by vendors of patent sheep dips than by any other cause, hence the determination of the Governments of all the Colonies to forbid the use of any specific except tobacco and sulphur, or lime and sulphur, for scab, or for the (precautionary) dressing of imported sheep while in quarantine.

As to our Colonial methods of curing and controlling stock diseases, I may add that, in the case of that under notice, scab in sheep, we have all along worked from a central authority, having found to our cost that local authorities were productive of much more harm than benefit.

But the great success of the "Diseases in Sheep Acts" in this and other Australian Colonies has been the enforced publicity given —under a heavy penalty—to all cases of disease. For instance, if scab were to appear on any station in Queensland, the owner of the sheep would have to comply with the following requirements:—1. To send notice to the local and chief Inspector; 2. to similarly notify his neighbours; 3. to insert a similar notice in a newspaper circulating in the District; 4. To put a notice on any road intersecting his Run. The Inspector on his part would have to define the boundaries of the Run, into or out of which no sheep would be allowed to pass, and this quarantine would be kept up for six months after the sheep had been dressed and found to be free from scab.

If the outbreak were a small one, say a small flock belonging to

a selector or farmer, it might be found expedient to burn them off at once, and pay for them from the fund accumulated under the "Diseases in Sheep Act," which has been created by an annual assessment on all sheep at the rate of 5*s.* per thousand.

It will thus be seen that the protection of sheep from disease, which has been most thorough, has not cost the consolidated revenue a single farthing, while the assessment—equal to 0·24 of a farthing per sheep—is a mere bagatelle.

P. R. Gordon.

[copy.]

Instructions for Dressing Imported or Infected Sheep.

Either one or other of the following preparations must be used in dressing imported or infected sheep :—

Tobacco and Sulphur.

Quantities.—One pound of sound leaf or manufactured tobacco and one pound of flowers of sulphur, to five gallons of water.

Mode of preparation.—Infuse the tobacco the night previous to dipping, by boiling the water and adding the tobacco in a proportion not exceeding one gallon of water to one pound of tobacco. Allow the infusion to stand all night in the boiler, well covered over. Mix the bath with hot water to the desired temperature and strength in the morning. Thoroughly mix the sulphur with the hand in a bucket, or other vessel, with water to the consistency of gruel before putting it in the bath, and keep it well stirred before immersing the sheep, so that all the particles of sulphur may be suspended in the liquid.

Lime and Sulphur.

Take in the proportion of ten pounds of flowers of sulphur to five pounds of quicklime (a large proportion partially slacked); boil in ten gallons of water. Keep mixed by constantly stirring for about ten minutes, or until a clear dark-brown orange-coloured liquid results. Then make up the dip or bath to the required quantity by mixing one gallon of this liquid with three gallons of hot water. If rock or unslacked lime cannot be procured, use double the quantity—that is, equal proportions of lime and sulphur.

Directions for Using the Bath.

Temperature.—Never allow the temperature to fall below 110° F., nor to exceed 120° F.

Duration of Bath.—Never less than fifty seconds for the *second*, and not less than eighty seconds for the *first* and *third* dressings. The whole body—with the exception of the head—to be kept completely immersed during that time. The head to be immersed, on

the sheep being placed in, and taken out of, the bath. Never allow the sheep to be exposed to rain for at least one day after dressing.

(Signed) P. R. GORDON,
Chief Inspector of Stock in Queensland.

Office of Chief Inspector of Sheep,
Brisbane, November 13, 1877.

[In addition to the information contained in Mr. Gordon's communication, flock-masters may be further interested in the following details, which are taken from Dr. Cooper Curtice's work, *The Animal Parasites of Sheep*, published by the United States Department of Agriculture at Washington.

Scab is a disease due to the presence of minute creatures which lead a parasitic life on the skin of their hosts. It is caused by the inflammation they excite in penetrating the skin, which they do in order to procure food, and also to find suitable conditions for the reception and hatching of their eggs. There are at least three species of these parasites, which are known as Acari, the disease they cause being called *Acariasis*. The species which attack sheep include :—

Sarcoptes scabiei, de Geer, var. *ovis*, causing head scab ;
Psoroptes communis, Fürst, var. *ovis*, causing common scab ;
Chorioptes communis, Verheyen, var. *ovis*, causing foot scab.

The life-history of these parasites is in general very similar. They attack the external skin of the animals in which they live by biting it. Soon after scabs are formed. Under these scabs the pests lay their eggs, which hatch out after two or three days, the progeny becoming adult in fifteen days. Each mature female is estimated to lay about fifteen eggs, two-thirds of which produce females. When hatched, the young invade fresh skin and repeat the life of their parents. The extension of scab disease is due to the migration and rapid propagation of the scab parasites. On the individual sheep the disease usually spreads as a constantly growing patch. The infected animal sometimes scatters the scabs by scratching, and thereby originates new centres of infection. The multiplication of the pests ceases only at the death of the sheep, or by killing the parasites by means of suitable remedies.

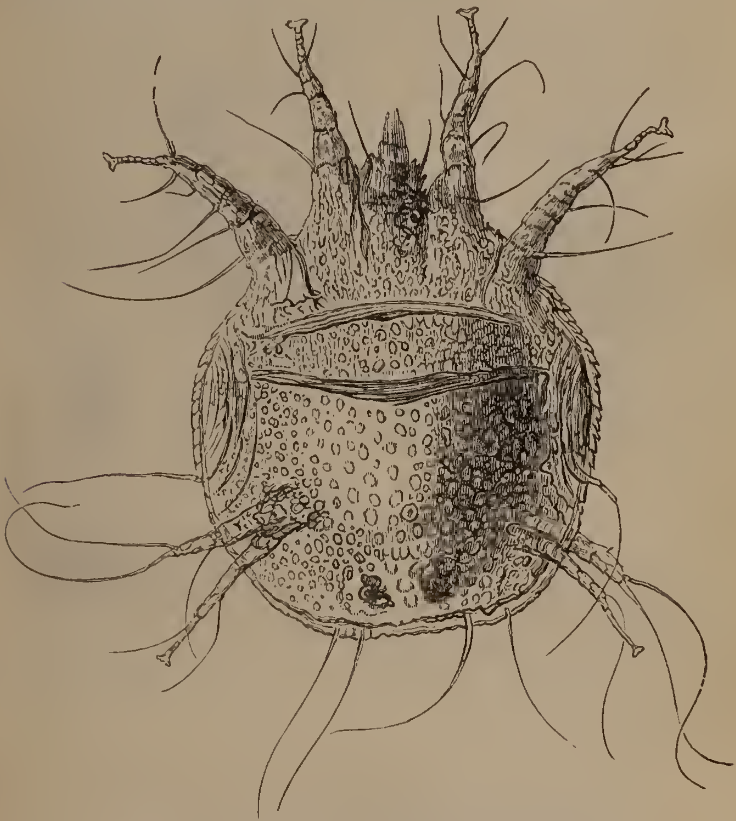
As common scab is the most frequent form of the disorder, and is that treated of by Mr. Gordon, the remaining remarks refer exclusively to it.

Common scab is caused by a parasite known as the scab-mite or itch pest—*Psoroptes communis*, Fürst., var. *ovis*. It is much larger than the *Sarcoptes*, which causes head scab, being visible to the unaided eye.

Disease.—Of the diseases of sheep, scab is one of the most feared by the flock-master. So insidious is its attack, so rapid its course, so destructive its effects, and so difficult is it to exterminate, that it has justly earned the distinction of being more injurious than any other disease caused by external parasites. Scab alone, of the parasitic diseases, has become the subject of legislation in most countries,

and yet, if proper precautions were taken and a rational treatment followed, this disease could soon be completely eradicated.

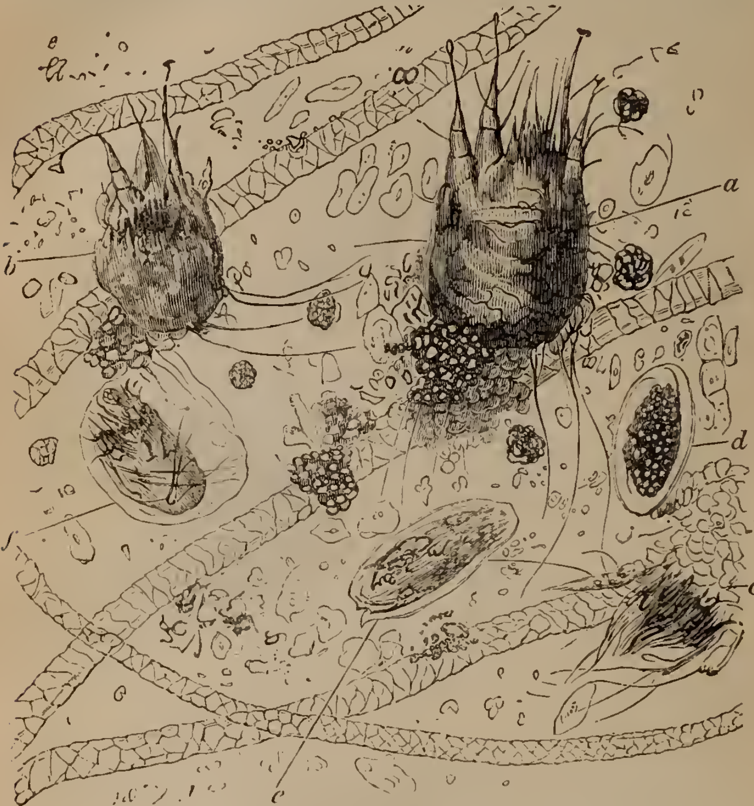
Early Symptoms.—Attention to the disease is first attracted by the infected sheep scratching, biting, and rubbing themselves. The coats of the animals look rough, taggy, and felted. The itching is always most violent when the sheep have been heated by driving or warming in a stable.



MATURE FEMALE ACARUS, FROM A SHEEP AFFECTED WITH SCAB.
(Drawn with the camera. Magnified 100 diameters.)

Pathology.—By separating the wool and examining a recently infected spot, there can be seen some minute elevations, which differ from the surrounding skin in being slightly whiter or yellower, and which have been produced by the bites of the pests. The insects themselves can be found among the hairs at but little distance from the bites. As time passes, and the insects multiply in number, these elevations become more and more numerous, and closer and closer together, until they finally unite over a considerable extent.

From the summit of the elevations or papules a watery, serous fluid exudes and accumulates, transforming them into vesicles and pustules, which in drying cover them over with a thin crust. In a few days the whole surface is covered with a yellowish, greasy, scaly layer, under which the parasites are hidden. As the disease



ACARI IN VARIOUS STAGES OF DEVELOPMENT, INTERMINGLED WITH WOOL AND MASSES OF SCAB.

a. Mature female acarus lying in a mass of scab.
b. Young acarus after change of skin.
c. Cast-off skin of an acarus.
d. Ovum, with the yolk contracted.
e. Ovum, containing a young acarus.
f. Ovum, with young acarus in the interior about to be hatched.
(Drawn with the camera. Magnified 60 diameters.)

proceeds this layer gradually increases in thickness by an increase of the serous exudate, and in circumference by the extension of inflammation produced by the ever-multiplying parasites which live beneath it, forming scaly crusts. These crusts, in being torn out, mainly by the rubbing with which the sheep endeavours to allay

its intense itching, carry with them the tags of the wool, the loss of which is an early symptom of the disease. At a later period the crusts are replaced by another set of thicker, firmer, adherent scabs, which are still further enlarged by the outward migration of the parasites. As they abandon the centre of the scabs these are again replaced by a peeling off of the external layers of the skin, which gradually heals, while the disease slowly progresses at the outside. The complete cure is very slow, and the skin remains thick and folded for a long time. In sheared sheep the skin becomes covered by a thick, dry crust like parchment, while beneath it remains much swollen.

Late Symptoms and Diagnosis.—The fleece of scabby sheep presents a characteristic rough look. In places the wool is stuck together in masses ; in others it fails, while in others, which are apparently sound, it can be easily plucked off. The rubbing and scratching indulged in by the sheep not only tend to tear away the wool but increase the irritation of the skin, which may become intensely inflamed and swollen, and finally end in a superficial death of the part. Unlike *Sarcoptes*, the *Psoroptes* seek the longest, thickest wool. They begin their attack along the back and extend to the neck, flanks, and rump. The pests are rarely found in the region of the chest and abdomen. They are collected in masses on circumscribed surfaces. The scabs they produce constantly increase at their edges, and their number depends on the number of places invaded. Owing to the closeness with which sheep congregate and to their violent scratching, the parasites become very generally scattered, and finally the scabs may run together.

While few of the parasites are present in the older diseased parts, at the edges of the scabs they can be found in swarms. They look like little white points with a brownish extremity. If picked up by the point of a knife or a sharp stick and placed on the hand they will be seen to move. The six-legged young, the eight-legged adults, the sexes, couples joined together, and the eggs of this injurious parasite, can easily be identified by the aid of a low-power magnifying glass.

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MANAGEMENT OF DAIRY COWS.

THE housing, feeding, and general management of dairy cows constitute a subject of primary interest to all agriculturists who are practically engaged in dairy farming. In the following brief notes I have recorded various points of practice which I have put to the test during my fifty years' experience in farming.

I will take the case of a dairy of ten cows, and describe the mode of feeding, housing, and management for one year, commencing at Midsummer. This is the date at which they require especial attention, for it will be found that if a cow, which has calved

during the spring, is allowed by any mismanagement to lose or reduce her milk after the turn of the days, it cannot be got back again. At this time the cows ought to lie out at night, and stand in cool, well-ventilated houses during the day, as the flies worrying them, and keeping them in a constant state of agitation, will not only reduce considerably the quantity of cream, but the quality of the butter is very much affected by it, although the quantity of the milk may not be so perceptibly reduced.

The cows are brought in for milking in the morning, tied in their respective places, and given a feed each of, say, 1 gallon of bran, 1 lb. of cotton-cake, and 1 lb. of linseed-cake. After they are milked they should be left to rest themselves all day, kept very quiet, and supplied at intervals as they require it with lucerne, sainfoin, or such other green food as may have been provided for their use, keeping before them a constant supply of clean water at a temperature of not less than 64° F. Before milking in the evening give them again a feed of 1 gallon of bran, 1 lb. of cotton-cake, and 1 lb. of linseed-cake, and when the flies have ceased to be troublesome turn the cows out for the night into their grass. This plan is continued till the day temperature is sufficiently reduced for the cows to enjoy the day air, when the method is reversed, the cows being taken in to milk at night and turned out after milking in the morning; they get their two feeds of bran and cake as before, and green food during the night. The change takes place generally about the middle of September—some seasons earlier and some later, varying somewhat in different localities.

Under this plan it will be found that the butter during the warm weather retains a nice firm consistency, and commands a higher price in the market than that of an oily, greasy nature made from cows that are constantly kept in a state of irritation. Lucerne and sainfoin conduce to a firm and desirable consistency.

As the autumn advances, and the grass diminishes in quantity in the pastures, the cows are turned out a little later in the morning and taken in a little earlier in the evening. Their feed of bran and cake is continued, 1 quart of maize meal and 2 quarts of oats being added to it, together with some chaff made of hay-silage and oat-straw. The same system is pursued till the end of October or beginning of November. As the grass becomes scarce, a little cabbage may be gradually introduced, and warm water added to the drinking-water immediately the latter approaches 64° F., which is the lowest temperature that should be allowed in the summer time, and 80° to 90° in the winter. If the cow has to drink water at a lower temperature than 64°, or to spend much of her time in an atmosphere of low temperature, she is being used as a machine for warming herself and the water, whereas she can be more profitably employed in producing milk. It does not pay to use food and living animals as machines for heating water in these days of sharp competition.

Water at 80° to 90° will be found to assimilate with the food, and to materially assist digestion in the winter time.

As the winter advances the dry food and cabbage are gradually increased according to the state of the weather. I will not prescribe the precise quantities, because I well know it is a fallacy to suppose that any practical cowman ever carries out such directions. He finds that some cows require more than others; and if he is allowanced in the total quantity of food, he has to take from one and add to another. A good cowman who observes some cows that daily increase their milk, and others that gradually decrease it, very judiciously adds a little more cake to the allowance of the former and takes it from that of the latter; it is observation of this kind that helps to make an efficient cowman. He soon learns the peculiarities of each of his cows, and their requirements at different seasons. Some cows will have a great flow of milk nearly up to the time of calving, while others will go dry several weeks before it. I have known Jersey cows, that have had nine or ten calves, never go dry at all, and no natural means could make them do so.

During the winter the allowance of cake and corn, as well as the bran and chaff, may be profitably increased, but the cabbage only sparingly, as many of them are not necessary. The cows are turned out for a little time each day, but only for a very short time in bad weather. They must, however, never be shut out or compelled to stay longer than they like, and immediately they return to their home should be let in and tied up, as they know better than we do what suits them best.

Sufficient cabbage should be grown to last to the middle of February each year, after which yellow-fleshed mangel is used in very moderate quantities.

I do not recommend turnips or swedes for dairy cows, as they can be more profitably used for young store stock and for sheep.

As the spring advances the same management is continued, only that the cows are allowed to remain out a few hours longer on fine days. When May Day arrives another critical time for the dairy begins. Many cow-keepers very injudiciously turn their cows and other young cattle out to grass at this time, and stop all or a great part of their dry food. Consequently the cows and other stock begin scouring; they not only spoil much of the grass by being on it so many hours, but they acquire a feverish state of the blood, which often causes eruptions on the udder and other parts of the body. Such eruptions also frequently come later in the summer, if the cows are turned into the aftermath too quickly after the hay is cleared. In May all the roots are stopped, and the usual dry meal is given. A little lucerne (cut the day before) may be gradually introduced to take the place of the dry food. The cows are not turned out before 9 o'clock in the morning, nor allowed out later than 5 or 6 o'clock in the evening.

In June, when the grass gets harder and firmer, the cows are allowed to lie out from the time they are milked in the morning to milking-time in the evening, but immediately the heat becomes great and the flies troublesome they are kept in by day and turned out at night.

Cows, when they are in season and require the service of the bull, should never be turned out with the other cows, as it upsets the whole herd. I have known 3 or 4 lbs. of butter lost in the day by this injudicious act. The cow should be put into a loose-box and kept very quiet for a day and night. There is another point in the management of cows which specially deserves mention, viz., their treatment for three weeks before calving, and the necessity of paying strict attention to the state of the udder. For my experience on these two points I have paid very dearly: I used to lose a cow or two most years from milk-fever after calving—and it was generally one of the best—until I was recommended to try the following plan, since which time I have never lost one. Three weeks before the time is up for calving the cow should be put into a loose-box and given nothing but dry hay (of only medium quality) and water, and twice during the time she should be drenched with $\frac{3}{4}$ lb. of Glauber's salts and $\frac{1}{2}$ lb. of flowers of sulphur. Especial attention should be paid to the state of the udder; as the milk begins to flow it should be eased at times, and, if any hard knobs or substance can be perceived, it should be frequently fomented with warm water and flannel, and some liniment rubbed well in each time.

I will here remark that the cowman should always have a man or lad whom he can call upon to do his work, or to help him when anything is wrong with a cow's udder—many a cow has lost either one or two quarters of the udder from the cowman not having time to devote to it. Provided he is always allowed to do this, he could often, by giving his whole day to fomenting and attending to the cow's udder, save it, and that at the very moderate cost of 2*s.* 6*d.* or 3*s.* I have sometimes made a man devote two whole days to this in obstinate cases, with most satisfactory results; in fact, I think I may go so far as to say there is no excuse for losing a part of a cow's udder if the formation is right—and where it is not, the cow ought not to have been selected for breeding purposes.

The cost of the purchased food as recommended in the above course will not exceed 5*s.* or 5*s.* 6*d.* per week, but many dairy farmers go far beyond this outlay.

To the foregoing I may add that I have always considered that one ton of hay would winter a dairy cow or a full-grown beast from November 1 to May 1, and that one yearling from eighteen to twenty-two months old, and one calf from nine to fifteen months old, are together equal to one cow or full-grown beast. I arrived at this conclusion from having adopted the following allowance for two successive years on a small farm. I had 15 cwt. of hay trussed each week and weighed.

	Per half year	Per week
10 cows at $1\frac{1}{2}$ truss per week each, or 84 lbs. for 26 weeks (allowing for waste)	10 tons	$7\frac{1}{2}$ cwt.
10 yearlings from 18 to 22 months old, at 56 lbs. per week each for 26 weeks	$6\frac{1}{2}$,,	5 ,,
10 calves from 9 to 15 months old, at 28 lbs. per week each for 26 weeks	$3\frac{1}{4}$,,	$2\frac{1}{2}$,,
	$19\frac{3}{4}$ tons	15 cwt.

The cowman was permitted to supplement this by adding as much cut oat or barley straw as he thought necessary. The cows weighed between 700 lbs. and 800 lbs. each.

I never allowed wheat straw to be used for feeding, considering it could be turned to better account, and regarding it as not a very digestible food. A very small quantity of cabbage to February, and mangel after that date, were allowed.

JOHN B. SPEARING.

TRAP-PLANTS FOR EELWORMS.

AMONGST the minute pests that cause serious loss to growers of crops the Eelworms have acquired a leading place. They occupy but a humble position in the scale of animal life, being very far below the insects which furnish the greater number of the animal pests of cultivated plants. Eelworms are members of a group of delicate, slender, minute organisms known as threadworms, a good example of which is afforded by *Trichina spiralis*, a parasite which infests swine, and gives rise to the disorder called "trichinosis," the latter sometimes attacking the human subject through the medium of imperfectly cooked pork or bacon.

The eelworms, or *Anguillulidæ*, as the systematist names them, are associated in the experience of English farmers with the troublesome disorder termed "clover sickness," which sometimes leads to great loss of plant in the clover-field. The parasite which attacks the stem of the clover plant is *Tylenchus devastatrix*, and the same pest is often equally mischievous in the case of oats, bringing about in that crop the disorder to which the names of "tulip-root" and "segging" are applied. A closely-allied eelworm, *Tylenchus tritici*, produces the "ear cockles," or "purples," of wheat, the grain becoming filled with immense numbers of minute eelworms, which can easily be brought into view when such a diseased grain is broken in a tumbler of clear water, the liquid at once becoming alive with thousands of the writhing nematodes.

There is another of these eelworms of which, however, we have hitherto heard little more than mere whispers in this country. It is called *Heterodera Schachtii*, and it is the cause of much havoc to the beetroot and mangel crops of the Continent. Its appearance on an extensive scale at any time in England would be a circumstance, therefore, that could cause no surprise, although, considering the costly character of the mangel crop, it might prove a great calamity. It is with this particular eelworm that the present note is concerned.

Up to about thirty years ago the parasite under notice does not seem to have been specifically identified, but in 1859 Hermann Schacht, of Bonn, in the course of a long series of researches upon the maladies of mangel and beet, brought the pest to light, though he fell

into the error of regarding it as an Acarus, or mite. Specimens of beetroot sent to him from Silesia, where the crop had been severely attacked, enabled Schacht to acquire a more correct view of the character of the parasite. After his death, however, the pest, the possibly serious nature of the ravages of which he had clearly foreseen, appears to have fallen out of notice. Such was the state of affairs when, in 1871, A. Schmidt, in *Zeitschrift für Rübenzucker-industrie*, directed public attention for the second time to this minute creature, and bestowed upon it the name of *Heterodera Schachtii*.

In subsequent years the "Rüben-nematode" (or beetroot thread-worm), as it came to be called in Germany, attracted the attention of Leuckart, Schneider, and other specialists, but it was not till 1881 that Julius Kühn, in his work *Untersuchungen über die Ursache der Rübenmüdigkeit* (Inquiries into the Cause of Beetroot Sickness), arrested the public notice by his account of the steadily growing losses to which chenopodiaceous plants were subjected through the activity of this pest. He gave a long list of the plants which harbour the eelworm, and then suggested the ingenious plan of combating its ravages by resorting to the use of what in France are termed *plantes-pièges*, which may perhaps be rendered in English as "trap-plants"; that is, plants cultivated with the express object of attracting the eelworms, or decoying them away from the soil which they infest. Recent researches have confirmed the belief that *Heterodera Schachtii* is capable of finding a congenial environment in numerous species of plants. That, as a recognised pest of beet and mangel, it should further extend its ravages to spinach, which, like them, is also a chenopodiaceous plant, is what might fairly have been anticipated. But it is found to equally attack the cereals, especially wheat and oats, and it marks as its victims a whole series of cruciferous plants, such as the turnip, swede, rape, cabbage, kale, kohl-rabi, radish, mustard, and cress.

In his instructive volume, *Zoologie für Landwirte*, published in March 1892, Dr. J. Ritzema Bos states that as a means of prevention Kühn (referred to in the preceding paragraph) recommends the employment of "decoy-plants." On worn-out beet ground he sows rapidly growing plants of a character that the eelworms readily infest. The plants are weeded out after the parasites have gone into them, but before the creatures are fully grown, or have again left the roots. The "decoy-plants" must be sown very thickly, so as to get as large a quantity of rootlets as possible in the soil. After these plants have been pulled up, a second set of "decoy-plants" must be grown, as all the eelworms in the soil will certainly not have migrated into the first lot of "catch-plants"; and it is even expedient to have a third growth.

As seen in the beet or mangel field, the symptoms of eelworm disease are fairly characteristic, for the leaves of the plant gradually change their bright green colour to a sickly yellow at about the beginning of July, or later, and ultimately die. An examination of the root shows this organ to be atrophied to such an extent that it

has only a quarter of the size of normally healthy roots of the same age. Blanched spots upon the root indicate the places where the eelworms are abundantly aggregated, and their presence is at once revealed by the use of the knife. The process of storing is powerless to arrest the progress of the disease, and in due time the material which is put into the clamp becomes a mass of putrid matter, whilst diseased sugar beets crushed in the sugar factory give only an indifferent yield of juice.

For a long time this eelworm disease was attributed to exhaustion of the soil, or to a lack of potash at the disposal of the plant, and great efforts were made to combat it by deep and thorough cultivation, and by the use of chemical, and especially of alkaline, manures. Change of crop was tried, beet and mangel being kept off the land in certain districts for a number of years, but without avail, for it is proved that this eelworm can live equally well in the soil as in the plant. It is in these circumstances that resort has been made to the use of *plantes-pièges*, or "trap-plants"—in Germany they are graphically described as *Fang-Pflanzen* (capture-plants). The method recommended is to sow the selected trap-plants upon the infested land at intervals from April to August, and to pull them at least three times during the season, at periods four or five weeks apart. The trap-plants are immediately burnt, the eelworms which infest them being thus destroyed. For the first sowing of trap-plants any of the varieties of cabbage may be used; for the later sowings, summer turnips. These plants are capable of harbouring, in their dense growths of finely-branched rootlets, immense numbers of the eelworms. The seed is sown in rows 4 to 6 inches apart. It is only by carrying out the system rigorously and effectively that land can be cleared of eelworms by this method of trap-plants. A year or two ago the plan was put into operation at Halle by M. Léon Le Fort, with excellent results.

An inquiry of practical importance suggests itself as to whether sheep, when fed upon eelworm-infested mangel, are capable of aiding in the dissemination of *Heterodera Schachtii*. In a recent article in the *Comptes rendus*, the question, *Le mouton peut-il propager l'Heterodera Schachtii?* is discussed at considerable length, and it is satisfactory to learn that the evidence is adverse to the supposition that sheep play any part in spreading the disease.

The whole subject of eelworm-disease of mangel and beet is fraught with such interest that it has formed the material of an elaborate investigation undertaken by M. Joannes Chatin on behalf of the French Ministry of Agriculture, and now embodied in a comprehensive report occupying fifty pages of the Bulletin,[1] and illustrated by nine full-page plates. M. Chatin concludes with certain practical recommendations which are worth recording. He says, in effect: "Examine carefully the roots of mangel and beet, and, in such as show any signs of withering, look for the presence of eel-

[1] *L'Anguillule de la Betterave* (*Heterodera Schachtii*), par M. Joannes Chatin. Bulletin No. 5, 1891.

worms, especially in the blanched spots or swellings produced upon the rootlets by the female worms. Pull up promptly all roots within a radius of 100 yards of the infested spots and burn them. Do not sow either mangel, beetroot, or cereals upon this land, but put it through a season's cropping with 'trap-plants.' Do not put on the land any plants, refuse matter, or composts suspected to be infested with eelworm; though, if such a course be unavoidable, treat all such material first with quicklime."

It is desirable to add that the females of *Heterodera Schachtii*, instead of possessing the usual worm-like form of the *Anguillulidæ*, are *lemon-shaped*. They grow to a length of about one-third of an inch, and produce internally some 350 eggs. A few of the latter, with some of the gelatinous substance of the egg-sac, are extruded, but the greater number remain within the body of the female, and there develop into larvæ. Ultimately the entire body of the mother is modified, as it were, into a sac filled with eel-shaped larvæ, which gradually escape. The free larva bores into the root-fibril of a mangel or beet plant, upon which it lives parasitically. The skin of the rootlet curves over the nematode, which meanwhile is approximating to the adult lemon-shaped outline, at the same time as the attacked plant assumes the appearance of eelworm disease.

W. Fream.

HARVESTING MISTAKES.

The bad weather for harvesting experienced in August and September last year afforded a severe test for the exercise of industry, skill, and ingenuity in the endeavour to make the best of circumstances, and to ward off the most serious ills to which the crops were exposed. Of course, no amount of toil or skilled endeavour could prevent that serious deterioration of quality in both barley and wheat which took place owing to the extensive battering down of the heaviest crops before they fully ripened, and it must be admitted, at the onset, that for some evils there could possibly be no other remedy than change of weather. But there was a large proportion of others which could be grappled with, and were overcome to a great extent by far-seeing, persevering, judicious operators; though a great many, on the contrary, folded their hands, some declaring that it was "what pleased God," and that they would await the rolling away of the clouds before attempting to do anything, while others, without thought or consideration, pursued the regular courses to which they had been mostly accustomed, and in no respect endeavoured to adapt action to the exigencies of circumstances.

Details must be entered into ere it will be seen to what an extent the indolent, listless, and foolhardy suffered in the late crisis more than those who brought intelligence, skill, and foresight to

bear on the state of things always experienced in such a protracted, precarious season as that recently passed through. Some crops are more liable to suffer than others by remaining uncut, and one of the gravest of the mistakes into which too many fell was not to give priority to oat-cutting in those days when some amount of reaping could be accomplished. The grain adheres to oat-heads by such frail stalks that, whenever crops are allowed to get thoroughly ripe, the first stiff wind that blows occasions prodigious shedding of the grain. This is the reason that the most experienced farmers always make it a rule to cut their oat crops, if possible, while they are still seemingly green in foliage, and only just changing colour towards ripeness. If there happens to be some slight shrinkage in yield of grain as the result, it is sure to be abundantly made up in the better quality of the straw for foddering purposes, if not in the avoidance of the evil of corn-shedding just adverted to.

Unfortunately, during the past season, there was an enormous loss in some districts on account of oats having been allowed to stand until they were over-ripe, and being exposed to the direful influences of some of the severest blasts ever known at harvest time. About the beginning of September, Mr. Teasdale H. Hutchinson, winner of the First Prize in Class I., Royal Agricultural Society's Farm Competition in Yorkshire, wrote to the papers that in some places the wind had threshed half the corn. He must, of course, have alluded to oats; for, although the stiff winds did take off the heads of barley rather extensively where the crops were over-ripe, it did not thresh them very much, and the heads were subsequently gathered up for utilisation in the rakings, if not in the main crop. Very much is it to be hoped, however, that even this evil was suffered considerably less than was apprehended at the time, it having, after the ingathering, been stated by competent authorities that the crops of Scotland and the northern counties of England, where oats and barley are grown more extensively than wheat, had suffered far less through bad weather than the crops of the south of England.

Another primary mistake into which some farmers of the southern and western counties fell was that of not tying their barley into sheaves, and placing the latter in stooks. They followed the old traditional custom of allowing their barley to remain in swathes to receive the benefit of three nights' dews, and then turning the swathes for the reception of three more. Such a method of managing barley may operate very well by causing an improvement in colour in fine weather, but has quite the contrary effect when rain falls incessantly almost every day, and the barley has to lie a long time on the ground. Some of the largest corn growers in those parts of the kingdom where this not very commendable custom prevails now employ self-binding reaping machines, and their barley, as well as their wheat and oats, was tied into sheaves in consequence.

On a farm in Gloucestershire where this was done, although the sheaves remained in the field after being cut a considerable

period, very little injury was sustained, while in an adjoining field on a bordering farm where the old method of cutting with the scythe and allowing the barley to remain in swathe was adopted, both grain and straw got to be sadly discoloured, and there was considerable sprouting of the former. Both fields were cut at the same time; but the grain of the one was secured fit for malting purposes, whilst that of the other was fit only for pig-feeding. The lesson to be derived is unmistakable. All farmers cannot afford to purchase self-binding reapers, but they can universally tie up their barley and place the sheaves in stooks when such untoward atmospheric influences prevail as those experienced in the recent autumn. The additional cost of the tying is generally repaid in there being less waste of grain in carting and stacking, but would naturally be saved tenfold in such a crisis as that then passed through.

A further mistake was committed in the management of the wheat crops after they were cut and sheaved. There was not much sprouting in the fields, owing to the cold weather that accompanied the rains, until towards the latter part of August, when the weather began to change. I do not hesitate to declare, however, that whatever amount of it was suffered might have been obviated by placing the sheaves into those small round "wind ricks" which met the eye far more generally in the times of our grandfathers than now, but which are still built every season in the mountainous districts of the Highlands, and the north of England, and Wales, wherever there is a particularly humid climate.

Whenever we happen to have a wet, precarious harvest, the custom of the country generally ought to be adapted to the course pursued in these districts, for it is very effectual in preventing wheat from sprouting after being sheaved, and also in allowing it to "condition" well, so as to be fit for early threshing. I state this much from experience, having in years gone by taught labourers how to erect such ricks by building them myself. The only art is that of setting a number of sheaves close together on their lower ends with their crops uppermost, in a circle of about four feet in diameter, the innermost sheaves being quite upright, and the outer ones only slightly inclining.[1] The builder, fixing himself on the centre of this foundation, would place on it continuous layers of sheaves as they were handed to him, all having their crops elevated to the interior of the rick and their lower ends inclining outwards. Each sheaf would be tightly packed, and have a bearing on its predecessor, and the rick might be made gently to swell until about four feet from the ground, after which it should be brought gradually up to a tapering point. There is greatest rapidity in construction when about a waggon-load of sheaves is placed in one rick and the latter is only made from eight to ten feet high.

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[1] See, in connection with this part of the subject, the communication on "Harvesting Wheat in Wet Seasons," which appeared in the Journal, Vol. I., Third Series, Part II. (1890), p. 450.—Ed.

It is astonishing how quickly such ricks can be made by women and lads bringing the sheaves under their arms to the fork-man who hands them to the builder. Perfect preservation from injury is insured, and on the first fine day after harvest the small ricks can be either carted to the stackyard for incorporation into larger stacks, or, what is more frequently done, a portable steam-threshing machine is fixed in the centre of the field, and they are carted to that, which is actually the most economical system of harvesting when threshing wheat has to be done immediately after harvest. Throughout every wheat district, those who adopted this method last autumn, just after cutting, found that they could thresh out their wheat not only early, but in first-class condition. On the other hand, many of those who did not had their grain so softened by the incessant rains and continuous exposure to the humid atmosphere that it has remained unfit to thresh until the spring.

These small ricks bear the name they are usually known by, from an old popular, but no doubt mistaken, belief that a stiff breeze passes right through them. The rustic mind has never been able to account for the admirable conditioning which invariably ensues, except by attributing it to the wind. But this proceeds all the same whether the latter be stiff or gentle. Consequently the free circulation of air to the innermost centres of the ricks would more probably be the true cause, added, of course, to the perfect protection the whole of the sheaf crops receive from wet, their lower ends being alone exposed.

JOSEPH DARBY.

OBITUARY.

The Right Hon. Sir James Caird, K.C.B., F.R.S.

Born 1816: Died February 9, 1892.

SINCE the last issue of this Journal, Agriculture has lost, in the person of Sir James Caird, one of its most famous representatives and exponents. His long and useful life as a reformer, a politician, an economist, a statistician, and an administrator, has been the theme of many obituary notices; but it is only in one aspect of his many-sided career that Sir James's history comes within the immediate sphere of action of the Royal Agricultural Society, and it is not, therefore, proposed in these pages to do more than touch briefly upon his experiences and achievements as an agriculturist.

Sir James Caird became a practical farmer at the beginning of the present reign, and he retained until the last his active interest in the work of the farm. When he left Edinburgh University, he went to Stranraer, where his uncle, Alexander McNeel, was a lawyer and bank agent. Soon after, he went into Northumberland to learn farming, and subsequently he managed a farm for his uncle a few miles from Stranraer, riding out to the farm early in the morning, and returning in time to take some part in the bank or law business.

About the year 1844, he took from the Earl of Galloway a lease of a farm at Baldoon. It was a holding with a lot of stiff clay land near the sea, and the sudden fall in the price of wheat at the time of the abolition of the Corn Laws must have been a serious blow to the young farmer. The rent was high, nearly 2*l.* an acre, and it is believed that the farm was never really profitable to Mr. Caird. The difficulties of working it apparently stirred him up to inquire as to possible cures for low prices, and his famous pamphlet on "High Farming as the best Substitute for Protection" was the outcome of his reflections.

This pamphlet, which appeared in 1849—when its author was thirty-three years old—made a great sensation, and went rapidly through eight editions. It was, indeed, the foundation of Mr. Caird's public fame; for he was sent by Sir Robert Peel in the autumn of 1849 to report upon the agricultural resources of the west and south of Ireland, and in the next year he made, for *The Times*, an elaborate inquiry into the actual state of agriculture in the principal English counties.

From 1852 to 1865, Mr. Caird was more or less immersed in politics, though he found time in 1856 to write for this Journal a short note on some experiments he had made as to manures for mangel. Whilst he was in the House of Commons, from 1857 to 1865, he did much excellent public work, and is especially entitled to gratitude for having, after years of fruitless endeavour, wrung from the Government of the day a vote for the collection of agricultural statistics. The returns for 1866, the result of that vote, were the first of a series that have since appeared annually, with ever-extending usefulness and completeness. In 1865, Mr. Caird accepted office under the Crown as an Enclosure Commissioner, and, for twenty-four years afterwards, until his final retirement at the end of 1891, he rendered invaluable services to the department which finally, in 1889, became merged in the Board of Agriculture.

It is worthy of note that throughout the whole of Sir James's busy public life he continued to be a practical agriculturist, as well as an administrator. At Baldoon, his first holding, he had a large dairy, and he introduced into that district the Cheddar system of making cheese, with such success that Cheddar is now almost the only sort of cheese made in the south-west of Scotland. Besides Baldoon, he took in 1864 Langley Park, in Kent, where he had at one time about one hundred cows, the milk of which was sent to London.

In 1860, he sold a property that he had inherited from his uncle, and bought Cassencary, in Kirkcudbrightshire, though he never farmed there. When his lease of Baldoon came to an end in 1865, his farming operations were confined to Langley Park. When that lease also expired in 1870, he took a lease of the Northbrook farms at Micheldever for his eldest son, Mr. J. A. Caird, and farmed there for some time, retaining a share in them until a few years ago. Thus he was always practically engaged in agriculture, which gave to his writings and utterances on the subject a greatly enhanced value. He liked nothing better than a day's farming, and was, until quite recently, a great walker. He would tramp from field to field of his estate, noting the results of the various manures and croppings; and there was hardly a point of agricultural practice on which he could not give an opinion from his own long and varied experience.

Sir James's contributions to agricultural literature were many and important. In addition to his early writings and reports already referred to, he wrote in 1859, after a visit to the United States, a book on "Prairie Farming in America;" in 1868 two papers by him "On the Food of the People," read before the Statistical Society, attracted much attention; in 1869, after a second visit to Ireland, he wrote a pamphlet on the Irish Land Question; and in 1883, after his tour in India as a member of the Famine Commission, he published "India, the Land and the People," which had a considerable circulation.

But it will hardly be too much to claim for this Journal that the most historically important and valuable of Sir James's literary labours appeared in its pages. No one who had not had his unique experience as a practical agriculturist and as a man of affairs could have written with so much authority and completeness the two articles on the "General View of British Agriculture," and on "Fifty Years' Progress," which appeared in the numbers of the Journal for October 1878 and March 1891 respectively. In the first paper (subsequently republished in a separate form under the title of "The Landed Interest," and translated into both French and German), Sir James gave a lucid and comprehensive description of the present state of agriculture in the United Kingdom, for the information of the Agricultural Congress which met at Paris during the International Exhibition of 1878. The paper discussed our home and foreign supplies of food; the changes and progress in agriculture in recent years; our soil, climate, and crops; the distribution of landed property; the relations of landowner, farmer, and labourer; land improvement; the varying values of land; the Government in its connection with agriculture; and many other kindred subjects. The second paper was contributed to the first number of the new Quarterly Series of the Journal at a moment when the Society had just completed its fiftieth year of corporate existence, and it contained a concise general survey of the changes which had taken place in the farming conditions of the country during the half-century of the Society's life. These papers,

interesting as they were when they were published, will be even more valuable and important in time to come, as affording a contemporary summary by an authority of undeniable competence of the state of agricultural affairs in this country in the nineteenth century.

Sir James Caird's first association with the Royal Agricultural Society dates back more than forty years. In 1851, at the time when his reports on the state of agriculture in England were appearing in *The Times*, he joined the Society as an ordinary member; and he took part at intervals in the weekly discussions on papers read, which were at one time held in Hanover Square. He himself read two papers, one in June 1861, on "Wool," and a second in May 1862, on the "State of Agriculture in Algeria," which he had visited during the cotton famine with the view of inquiring into the possibility of extending the production of cotton in that and other countries.

In August 1861, he was nominated for a seat on the Council, and it is a little curious that the rival candidates on that occasion were two such remarkable men in different spheres of usefulness as Mr. Caird and Mr. Charles Randell. The typical tenant farmer won the day; and when later the offer of a seat on the Council was again made to Sir James, his official responsibilities were so great that he was unable to accept the invitation. The Council elected, therefore, in his stead his eldest son, Mr. J. A. Caird, who has since done yeoman service to the Society as a Member of the Journal, Chemical and other important Committees, and as a Steward at the Society's Shows.

At the beginning of 1890, when the Society's fiftieth year of existence was drawing to a close, it was felt by the Council fitting that the very rare distinction of its Honorary Membership should be conferred upon Sir James Caird, "in recognition," as the formal resolution ran, "of his distinguished services to agriculture." It is interesting now to note that this resolution, moved by Earl Cathcart as Chairman of the Committee of Selection, was seconded by Sir Jacob Wilson, who, after Sir James's retirement from office last December, was appointed to succeed him as head of the Land Department of the Board of Agriculture.

Sir James took an active interest in the affairs of the Society of which he was so distinguished an ornament, and was at all times helpful and encouraging to younger men engaged like himself in the advancement of British agriculture. The general regret amongst agriculturists at his loss is tempered by the feeling that he has departed from amongst us, leaving his life's work completed, in ripeness of years and fulness of honours.

ERNEST CLARKE.

WOODS AND PLANTATIONS IN GREAT BRITAIN.

The extent of the Woodlands of Great Britain formed, in 1891, the subject of a special inquiry by the Board of Agriculture, as the attention lately drawn to the question of forestry appeared to justify a closer investigation and the adoption of more direct methods of inquiry in the matter. The previous occasions when Returns of Woods and Plantations were called for were in 1872, in 1880 (with an amended publication in 1881), and in 1888. Great difficulties were reported as having been encountered in each of these attempts, and the published totals were confessedly defective.

It is not easy at all times to secure a uniform definition of woods or forests; and areas whereof the surface is grazed, although studded more or less closely with trees, may conceivably be dealt with either as woodland or as permanent grass or mountain land. The parochial Rate Books, moreover, have proved very defective guides to the collecting officers on this point. Greater accuracy is believed to have been secured in the new inquiry by direct personal application to the holders of wooded land, and in many instances corrected measurements are now obtainable from the Ordnance Survey Maps. But the improvement in the data now collected forbids their offering really comparable figures to the approximate records hitherto available.

Were it permissible to contrast the 2,187,000 acres of 1872, or the 2,458,000 acres of 1881, or the 2,561,000 acres of 1888, with the 2,695,000 acres which are now stated by the Board to represent the woodland surface of Great Britain, a large apparent advance must be admitted; but it is obvious this must be set down rather to better information and closer measurements than to an actual increase of woods. The extent to which the advance is due to greater knowledge of the facts, rather than to extensive planting, appears by one branch of the inquiry, from which it would seem that the "plantations," strictly so called,—limiting the term to cases where the planting has been effected since 1881—covered less than 103,000 acres, whereas a reference to the inquiry of 1880–81 would make the apparent decennial growth of area 237,000 acres,—and this although it is recognised that some of the more recent planting has only balanced areas from which the trees have been felled in this interval.

Of the 134,000 acres added by the more accurate figures of the new inquiry to the approximate woodland area of Great Britain as recorded in 1888, about 96,000 acres occur in England, 7,000 acres in Wales, and 31,000 acres in Scotland. It is noteworthy, moreover, that two-fifths of the surface planted in the last ten years is returned from Scotland alone, while practically half of the 41,000 acres of new plantations in that country are accounted for by the

returns from the counties of Aberdeen, Inverness, and Ross and Cromarty. In England, the counties where most planting would seem of late to have been done are Devon and Hants in the south, and Yorkshire, Northumberland, and Cumberland in the north.

The county of Hants now stands in the Returns as possessing the largest area of woodland in England, or 122,574 acres. Sussex, with 122,073, comes second; while the four counties of Hants, Sussex, Surrey, and Kent, forming the south-eastern corner of England, possess between them nearly a fourth of the English woods and plantations, showing over 11 per cent. of their surface thus occupied, in contrast with 4 per cent. as the mean of the rest of the country.

In Scotland, the county of Inverness accounts for 169,000 acres of woodland. This area is far the largest in Great Britain. It is considerably in excess of the surface returned as under all forms of crops or grass in that county, and nearly equal to a fifth part of the whole of the Scottish woodlands.

If the Irish record of woods and plantations annually shown in the Returns for that country, and now amounting to 311,351 acres, be added to the aggregate now obtained for Great Britain and to the figures obtained from the Isle of Man and the Channel Islands, the woodland area of the United Kingdom may be taken as 3,007,569 acres.

The following Summary Table has been compiled from the detailed particulars as to the woodlands in each county given in the Agricultural Returns for 1891 :—

Acreage in Great Britain of Woods and Plantations for the years 1888 *and* 1891, *and of Nursery Grounds for the years* 1890 *and* 1891.

Thousands ("000") omitted.

—	England, 1891			Wales, 1891			Scotland, 1891			Total for Great Britain, 1891		
	Rent'd	Owned	Total	Rent'd	Owned	Total	Rent'd	Owned	Total	Rent'd	Owned	Total
Woods [1].	157	1,404	1,561	36	130	165	44	820	865	238	2,354	2,592
Plantations [2]	7	45	52	2	7	10	2	39	41	11	91	103
Woods and Plantations	164	1,449	1,613	38	137	175	46	859	906	249	2,445	2,694
Woods and Plantations	—	—	(1888) 1,518	—	—	(1888) 168	—	—	(1888) 875	—	—	(1888) 2,561

	England 1890	England 1891	Wales 1890	Wales 1891	Scotland 1890	Scotland 1891	Total for Great Britain 1890	Total for Great Britain 1891
Nursery grounds [3]	11	11	—[4]	—[4]	1	1	13	13

[1] Except plantations. [2] Planted during the last ten years.
[3] Land used by nurserymen for growing trees, shrubs, &c. [4] Under 1,000 acres in extent

THE WEATHER OF 1891.[1]

First Quarter.—The weather in *January* was dry and very cold, with frequent fog and snow. It was a continuation of the very cold weather which set in on November 25th, and thus continued for 59 days. At Blackheath the mean temperature of many days was below the average by more than 10°, on the 10th the deficiency amounted to $18\frac{3}{4}$°, and on the 11th to nearly 15°; the temperature of the 17th, 18th, and 19th was more than 12° below the average. It was warm and above its average from the 23rd to the end of the month, being particularly mild and warm on the 24th, 28th, 29th, and 31st days, when it was 9°·3, 7°·3, 7°·5, and 7° respectively above its average. The atmospheric pressure was above its average till the 19th, particularly so from the 10th to the 15th, the mean daily excess for these six days being 0·68 inch, then below from the 20th to the 24th, and above again from the 25th to the end of the month. The fall of rain was a little below its average, and vegetation was backward.

The weather in *February* was fine and dry, but with frequent fog. Snow fell at a few places on the 14th. The temperature of the air was generally above its average till the 8th, generally below from the 9th to the 26th, and above its average again on the 27th and 28th. The atmospheric pressure was above its average throughout the month, with the exception of the 26th, when it was 0·01 inch below; on several days varying from $\frac{1}{2}$ an inch to $\frac{3}{4}$ of an inch above its average. The fall of rain was exceedingly small all over the country: no rain fell at Oxford, and at several stations only 0·01 inch fell; at the Royal Observatory, Greenwich, only 0·050 inch fell, and there are only four instances of as small or smaller fall of rain in the month of February back to 1815, viz.:—

1870 it was 0·054 in.	1834 it was 0·040 in.
1857 „ 0·020 „	1821 „ 0·004 „

The weather in *March* was warm and pleasant during the first week, and the remainder of the month was cold and stormy, with frequent snow. The temperature of the air was above its average till the 7th, and below it from the 8th. The atmospheric pressure was above its average till the 5th, and was below it from the 6th. There was a heavy snowstorm on the 9th and 10th, accompanied by a gale of wind. The snow was general, but was particularly heavy on the southern parts of England. The snow was deeper in Cornwall and Devonshire than elsewhere; in these counties many railway trains were blocked for several days notwithstanding the labour of several hundreds of men. Plymouth suffered very severely both from snow and wind. Vegetation at the end of the month was very backward.

[1] Abstracted from the particulars supplied to the Registrar-General by James Glaisher, Esq., F.R.S., &c.

Second Quarter.—The weather in *April* was dry and very cold throughout. The temperature of the air was below its average on nearly every day. The atmospheric pressure was above its average from the 9th to the 26th, and below on all other days. The fall of rain was small. The prevalent winds were E. and N.E. Owing to the cold winds and low temperature, vegetation at the end of the month was very backward.

The weather in *May* was very changeable, but was mostly cold and unseasonable. The temperature of the air was generally below its average till the 10th day, when a sudden change to warmer weather took place, the 11th, 12th, 13th, and 14th days being above their average mean temperature, that on the 13th as much as 11°, when another sudden change took place to colder weather, the mean temperature of the 16th, 17th, and 18th days being as much as $12\frac{1}{2}$°, 14°, and $13\frac{3}{4}$° below their averages, and the weather continued cold to the end of the month. On the 13th the temperature around London was about 80° ; on the morning of the 18th the temperature fell below 32°, and there was frost over the greater part of England, and the temperature about London did not rise so high as 50°. The atmospheric pressure was below its average till the 3rd day and from the 15th, and was above, with the exception of the 9th and 10th, from the 4th to the 14th. On the 18th it was as much as 0°·62 below the average for the day. The fall of rain was above the average ; it fell on every day from the 18th to the end of the month. The most remarkable circumstance in the month was the fall of snow on the 15th, 16th, 17th, and 18th days, following so soon after the hot weather of the 11th to the 14th ; the snow fell at nearly all stations from Torquay in the south to Carlisle in the north,—small in quantity at southern stations, but to the depth of two to six or more inches in the midland, eastern, and northern counties. Vegetation at the end of the month was very backward.

The weather in *June* for the most part was bright, warm, dry, and seasonable. The temperature of the air was above its average till the 5th day, below from the 6th to the 16th, and above again from the 17th to the end of the month. The atmospheric pressure was below its average till the 10th, above from the 11th to the 22nd, and below again from the 23rd to the 30th. The fall of rain was small and below its average. There have been only 13 instances of as small or smaller fall of rain in the month of June back to the year 1815, viz. :—

1886 it was 0·44 in.	1855 it was 0·70 in.	1827 it was 0·70 in.
1877 „ 0·70 „	1850 „ 0·90 „	1825 „ 0·80 „
1870 „ 0·39 „	1849 „ 0·30 „	1822 „ 0·90 „
1868 „ 0·50 „	1846 „ 0·50 „	1818 „ 0·70 „
1864 „ 0·90 „		

The month was favourable for agriculture, but from the preceding long-continued cold weather crops were generally backward, and hay-making at the end of the month had not begun.

Third Quarter.—The weather in *July* was cold, dull, and unsettled, with a great want of sunshine. The temperature of the air was below its average on every day excepting the 16th and 17th, the 21st, 22nd, and 26th days, and particularly so during the last week. The atmospheric pressure was below its average till the 8th and from the 27th, and generally above from the 19th to the 26th. The fall of rain was variable, but generally less than the average; it fell during the first week and from the 27th. There was very little good hay-making weather during the month.

The month of *August* was cold, wet, stormy, and ungenial. The temperature of the air, with the exception of two or three days, was below the average, and particularly so till the 7th. The atmospheric pressure was below the average, with the exception of a few days, and particularly so from the 21st to the 27th, during which interval the weather was stormy, and there was a great gale on the 25th and 26th. Rain fell frequently and for several days together from the 18th; at Blackheath on the 21st more than one inch in depth of rain fell. The weather greatly delayed the hay crops, and also did damage to the grain crops. The gale of the 25th did much injury to hops and fruit.

The weather in *September* was for the most part fine and warm; very little rain fell during the first half of the month. The temperature of the air till the 7th, and from the 21st to the 24th, was a little below the average, and was above on all other days. The atmospheric pressure was below the average till the 7th, and was generally above from the 8th. Till the 18th but little rain fell, and then light rain fell for a week. The hay harvest was generally secured, and a good deal of grain was gathered in at the end of the month.

Fourth Quarter.—The weather in *October* was mild and very wet, with frequent high wind. The temperature of the air was for a few days together a little above the average, and then for a few days a little below, till the last two days, which were very cold. The atmospheric pressure was low from the 6th to the 26th, particularly so on the 13th, 21st, and 22nd; on the 13th the readings were lowest at the northern stations, and were below 28·5 inches. Around London the lowest readings were about 29 inches. There was a very heavy gale of wind on the 13th and 14th: many ships were wrecked, trees were blown down, and some lives were lost. The fall of rain was heavy, causing floods in many places. In London the rainfall was about $4\frac{1}{2}$ inches in depth, at Greenwich it was 4·3 inches. Back to 1815, the instances in October of a rainfall as heavy are as follows:—

1882	it was	5·4 in.	1855	it was	4·9 in.	1841	it was	6·0 in.
1880	,,	7·7 ,,	1853	,,	4·3 ,,	1831	,,	5·5 ,,
1872	,,	4·3 ,,	1846	,,	5·1 ,,	1827	,,	4·4 ,,
1865	,,	6·0 ,,	1843	,,	4·3 ,,	1823	,,	4·4 ,,

The floods in several parts of the country caused great inconvenience; wheat sowing on heavy lands was stopped.

The weather in *November* was cold during the first week and from the 23rd, with a fall of rain below the average at most stations, and foggy at many places. The temperature of the air was above its average from the 11th to the 20th, and generally below on all other days. The atmospheric pressure was above its average till the 8th, and generally below from the 9th, particularly so on the 11th. The reading at Blackheath at 11 A.M. on this day was 28·27 inches ; this was followed by a very severe gale, which continued for seven or eight hours, uprooting many trees. The fall of rain was less than the average, and fog was prevalent, particularly in the Midland counties.

The weather in *December* during the first half of the month was wet and mild. The temperature of the air was above its average till the 16th and from the 26th ; and below it from the 17th to the 25th, and particularly so from the 19th to the 25th ; the average deficiency of mean daily temperature for the seven days from the 19th to the 25th was 13½°. The atmospheric pressure was generally below its average till the 16th and from the 25th, and particularly so on the 10th and 13th. There were a succession of gales from the 8th to the 13th ; that of the 10th was the most severe, when many trees were uprooted. The rainfall was above the average, thus causing all low-lying lands to be very wet, and greatly checking agricultural operations.

RECENT AGRICULTURAL INVENTIONS.

The subjects of Applications for Patents from Dec. 17, 1891, *to March* 12, 1892.

N.B.—When the Invention is a communication from abroad, the name of the Inventor is shown in italics, between parentheses, after the name of the applicant.

Agricultural Machinery and Implements, &c.

No. of Application.	Name of Applicant.	Title of Invention.
Year 1891.		
22364	DAVIES, E. . . .	Shakers for threshing machines.
22528	BEELEY, J. . . .	Root pulpers.
Year 1892.		
213	BOULT, A. J. (*The Massey-Harris Co., Canada*) . . .	Grain binders.
217	„ „	Harvesters.
288	CHAVEZ, A. M. . .	Ploughs.
343	MCKAY, R. . . .	„

No. of Application.	Name of Applicant.	Title of Invention.
Year 1892.		
450	THOMPSON & DUNCAN .	Plough coulter-clearing and dung-spreading appliance.
687	HARDY, P. M. . .	Cultivator.
728	BEUKEMA & JANSSEN .	Chaff-cutting machine.
1162	LUMSDEN, J. . . .	Harvesting machines.
1228	SCANDRACOF & DIMOVITCH . . .	" "
1528	YATES, R. P. & J. . .	Hoes or picks.
1543	BLACKSTONE & TIMMIS	Clod-crusher.
1798	ADSIT, L. G. . . .	Combined horse-hoe and scraper.
1976	GRIEVER, L. H., & FLEISCHER, A. . .	Binding grain.
2675	CLARK, R. A. . .	Digging and riddling potatoes.
2776	TURVEY, J., & STONE, H.	Mowing and reaping machines.
2793	HANSON, J. H. . .	Harrows.
2865	KOHLERT, C. . .	Ploughs.
2925	CAMP, W. F. . . .	"
2929	ASVANTI, L. . . .	Harrow for extirpating parasites from clover.
3303	THOME, J. E. . .	Horse rakes.
3455	FORMAN, J. H. . .	Potato-planting attachment for agricultural implements.
3628	HARRISON, J. . .	Hay-tedders.
3657	BINGHAM, W. J. . .	Handle for scythe-snaths.
4036	PIERCE, P. . . .	Seed drills.
4067	MITCHELL, H. . .	Reaper-section grinding machine for grinding the swage on reaper sections, &c.
4315	SARGEANT, T. C. . .	Harvesting machines.
4365	MILTENBEYER, T. .	Horse hay-rakes.
4671	BACKHOUSE, J. . .	Ploughs.
4924	WEEKS, T. D. . .	Ploughs.
4717	PERKINS, J. E. S. . .	Hay-making machines.
4807	MUNDAY, J. . . .	Distributing artificial manures, &c.

Stable Utensils and Fittings—Horse-shoes, &c.

Year 1891.		
22094	WHIPPLE, C. A. . .	Horse-shoes.
22249	SMITH, H. G. B. . .	Horse-collar.
22365	DURHAM, E. B. . .	Horse cooler.
22550	NUNN, G. R. . . .	Horse-shoes.
22851	SANDBACH, H. M. .	Nasal respirating check for horses.
Year 1892.		
230	BRAUN, W. . . .	Horse-shoes.
344	GRIERSON, J. . .	Harness-tug.
597	ALLEN, J. W. . .	Coned-bottom horse-shoe.
777	TROWBRIGE, L. J. .	Horse-shoes.

No. of Application.	Name of Applicant.	Title of Invention.
Year 1892.		
806	CARLIER, G. & L.	Horse-collars.
920	ADDERLEY, S.	Saddle-plates.
938	PEACH & HOWSE	Riding stirrups.
1263	THORNHILL, H., and others	Bits.
1305	MAXWELL, H. M.	Adjustable saddle-girth.
1369	" "	Bridles.
1407	ELI, A. J. (*Atkinson*)	Bridle-bit.
1766	WILTON, H. S.	Girthing attachment for ladies' saddles.
1796	BRUNER, W. R.	Harness buckle.
1843	BLAKE, A. J.	Horse-shoes.
1947	PERKINS & SMITH	"
2069	EASTON, H.	Reins.
2282	BOND & GOODFELLOW	Stirrups.
2362	SIMMONS, W. J.	Improved bit.
2478	JONES & BOOTE	Pommels of ladies' saddles.
3409	HENCKE, A.	Safety calks for horse-shoes.
3495	LANE, R. A.	Saddle-girths.
3625	MYALL, A. (*de Lotbinière*)	Stirrups.
3644	THOMPSON (*Springsteen*)	Preventing self-abuse in stallions.
3687	KING, F.	Driving-reins.
4000	FURGSCHAT, F. W.	Rapid fastening and unfastening of horses.
4017	LAKE (*Weston*)	Electrically stopping and starting horses.
4099	KING, J. C.	Curricle whip-springs for harness.
4100	MCHARRIE, J.	Horse-shoes.
4168	BOULT, A. J. (*Colti*)	Curing horses of snapping, &c.
4478	HADDAN, H. J. (*Brower*)	Pad for stirrups.
4566	GRAVELEY, F.	Horse-shoes.
4635	DALY, W. H.	Safety stirrup-bar.
4757	PALFRIE, S., & BROWN, T.	Horse-shoes.
4760	SCOTT, J. J.	Attaching horse-shoes.

Carts and Carriages.

Year 1891.		
22446	MORTON, A.	Bogies, or sledges for ingathering hay, &c.
22771	DELANEY, D. C.	Waggon for transport of hay.
Year 1892.		
1280	KENNEDY, J.	Vans, carts, dog-carts, &c.
1639	YOUNG, A. W.	Displaying the weight of carts, &c.
1828	MULLINER, H. H.	Carriages.
4123	MILLS, B. J. B. (*des Georges*)	Brake apparatus.

Dairy Utensils, &c.

No. of Application.	Name of Applicant.	Title of Invention.
Year 1891.		
22059	BAKER, S.	Milk churn.
22065	POND, S.	Cans for conveying milk.
22155	GEBBIE, J.	Milking apparatus.
22661	CUMMING & WALLACE	" "
Year 1892.		
269	MEAD, W.	Milk churns, pails, &c.
298	KEMPKENS, H.	Cheese presses.
347	MUNNS (*Linebarger*)	Churn.
546	THOMSON, J. S.	"
627	THOMPSON, W. P. (*Anderson & Fargo*)	Butter-workers.
1027	FRENCH, W. F.	Lock for milk-cans.
3729	PETT, J. H.	Barrel churns.
3925	MALMEOS, A.	Cream-separators.
4179	WELLMAN, E. S. T.	Driving churns.
4396	SINTON, W.	Churns.

Poultry and Game, &c., Appliances.

Year 1891.		
22396	PEISIER	Feeding-troughs for fowls, &c.
Year 1892.		
42	RILEY, W. J.	Packing-cases for eggs.

Miscellaneous.

Year 1891.		
22324	SCARFE and others	Sheep-shearing machine.
22774	NASH	" " "
22822	BUCHANAN, A.	Floors for cattle stalls, stables, &c.
Year 1892.		
385	BIRKHEAD, T.	Sheep shears.
423	MANSELL, E.	Medicinal powder for animals.
1079	MELCHIOR, J.	Sheep-shearing machines.
1274	McLEOD, G. A.	Assisting ewes during lambing.
1388	RYLAND, H. G.	Dog-collars.
1475	PIFFARD, B.	Preparing oats for cattle.
1714	ACKLEY, P. H.	Beehives.
1727	WATSON, W.	Guard for protecting wheat stacks from vermin.

No. of Application. Year 1892.	Name of Applicant.	Title of Invention.
1792	HAWTHORNE, W. A.	Supers for beehives.
1824	FROST, C. E.	Travelling box for dogs.
1962	DAVIES, W. H.	Devices for training hops.
1968	BINNS, G. A.	Hand comb for animals..
4564	BAZELEY, W.	Glazed queen and drone excluder for beehives.
4801	KOLHE, W.	Drinking troughs for cattle.

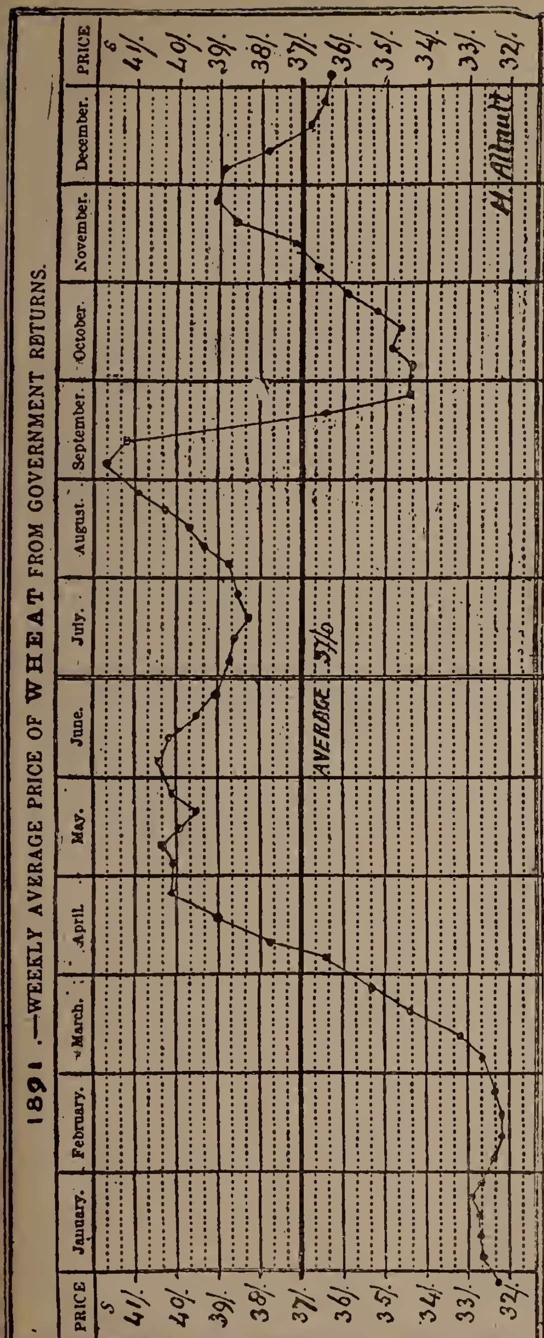
Numbers of Specifications relating to the above subjects Published since Dec. 19, 1891.[1]

N.B. All printed specifications are now on sale at a uniform price of 8*d.* each including postage.

Specifications of 1891.

270, 273, 449, 1026, 1166, 1245, 1266, 1516, 1591, 1917, 2175, 2292, 2532, 2709, 3415, 3492, 3653, 4086, 4097, 4114, 4128, 4343, 4455, 4500, 4742, 5541, 6241, 6661, 6666, 7017, 7501, 7641, 11875, 12399, 14863, 15903, 16662, 16853, 17106, 18631, 18937, 19236, 19454, 19590, 19753, 20395, 20534, 20782, 20870, 20959, 21361, 21458, 21462, 21734, 21890, 22324, 22774.

[1] Copies may be obtained at the Patent Office (Sale and Store Branch), 28 Cursitor Street, London, E.C.



1891.—WEEKLY AVERAGE PRICE OF WHEAT FROM GOVERNMENT RETURNS.

THE PRICE OF GRAIN IN 1891.

AVERAGES FOR 1891.

	s.	d.
Wheat	37	0
Barley	28	2
Oats	20	0

THE annual Imperial average price of *wheat* has risen 5*s.* 1*d.* a quarter above that of 1890. In the latter year the average was 31*s.* 11*d.*, whereas in the past year it was 37*s.* a quarter. The weekly fluctuation has been greater, ranging 9*s.* 5*d.*; in 1890 it was 6*s.* 10*d.* The highest weekly average in the past year was 41*s.* 8*d.* on September 5. The price has not touched 40*s.* for about 10 years, viz., in 1883, but in that year it rose to 43*s.* 10*d.* The lowest weekly average in the past year was 32*s.* 3*d.* on February 14 and 21. A great fall in the price of wheat took place on September 12 from 41*s.* 2*d.* to 36*s.* 5*d.* on September 19, and again to 34*s.* 5*d.* on September 26. The annual average price of *barley* was close on that of 1890, it being 28*s.* 8*d.* in that year, and 28*s.* 2*d.* in the past year. The highest price was 31*s.* 8*d.* on November 21, and the lowest 24*s.* 4*d.* on August 15. The fluctuation was therefore 7*s.* 4*d.*; in 1890 it was 9*s.* 9*d.* The annual average price of *oats* was 20*s.*; in 1890 it was 18*s.* 7*d.*, the highest price 22*s.* 4*d.* on November 21, and the lowest 17*s.* 6*d.* on January 10. The fluctuation was 4*s.* 10*d.*; in 1890 it was 3*s.* 2*d.* The annual Imperial average price of corn in 1891 was—Wheat 37*s.*; Barley 28*s.* 2*d.*; and Oats 20*s.* The septennial tithe rent-charge is 5*s.* $0\frac{1}{2}$*d.* lower this year than last, it being 76*l.* 3*s.* $3\frac{3}{4}$*d.* in that year, whereas it is now 75*l.* 18*s.* $3\frac{1}{4}$*d.* per 100*l.* The average from the commutation in 1836 is 100*l.* 4*s.* $4\frac{1}{2}$*d.* This latter is taken from Willich's Tithe Tables.

HENRY ALLNUTT.

STATISTICS AFFECTING BRITISH AGRICULTURAL INTERESTS.

TABLE I.—*Average Prices of British Corn per Quarter (Imperial Measure) as received from the Inspectors and Officers of Excise conformably to the Act of* 45 & 46 *Vict. ch.* 37, *in each Week of the Year* 1891.

[*From the "London Gazette."*]

Week ending	Wheat		Barley		Oats		Week ending	Wheat		Barley		Oats	
1891	s.	d.	s.	d.	s.	d.	1891	s.	d.	s.	d.	s.	d.
January 3 .	32	7	28	5	17	9	July 4 . .	38	9	26	9	21	1
January 10 .	32	8	28	5	17	6	July 11 . .	38	7	26	2	20	11
January 17 .	32	9	28	6	17	9	July 18 . .	38	3	26	1	21	6
January 24 .	32	11	28	6	18	0	July 25 . .	38	6	25	7	21	9
January 31 .	32	8	28	10	18	0	August 1 .	38	9	26	6	21	5
February 7 .	32	5	28	5	18	0	August 8 .	39	4	26	4	21	2
February 14 .	32	3	28	0	18	0	August 15 .	39	8	24	4	21	4
February 21 .	32	3	27	9	18	0	August 22 .	40	3	26	3	21	3
February 28 .	32	4	27	5	18	2	August 29 .	40	11	27	7	21	9
March 7 . .	32	7	27	7	18	5	September 5 .	41	8	29	3	21	8
March 14 .	33	2	27	9	18	6	September 12 .	41	2	28	11	21	1
March 21 .	34	5	27	5	18	6	September 19 .	36	5	28	1	19	1
March 28 .	35	3	27	11	18	6	September 26 .	34	5	28	0	18	10
Average of Winter Quarter	32	11	28	1	18	1	Average of Summer Quarter	39	0	26	11	21	0
April 4 . .	36	5	27	10	18	11	October 3 .	34	4	28	10	18	5
April 11 . .	37	9	27	4	19	3	October 10 .	34	10	28	11	18	7
April 18 . .	39	0	27	9	19	6	October 17 .	34	9	29	6	18	10
April 25 . .	40	1	27	11	20	3	October 24 .	35	2	29	11	18	8
May 2 . .	41	1	28	1	20	7	October 31 .	35	11	30	7	19	5
May 9 . .	41	4	28	9	21	1	November 7 .	36	7	30	11	20	6
May 16 . .	39	11	27	11	20	9	November 14 .	37	2	30	11	21	4
May 23 . .	39	6	27	1	20	11	November 21 .	38	9	31	3	22	4
May 30 . .	40	1	26	9	21	1	November 28 .	39	1	30	11	22	4
June 6 . .	40	5	28	3	21	1	December 5 .	38	11	30	9	22	2
June 13 .	40	2	27	2	21	3	December 12 .	37	10	30	1	21	7
June 20 . .	39	6	26	6	21	2	December 19 .	36	10	29	6	21	4
June 27 . .	39	0	28	3	21	0	December 26 .	36	6	29	4	20	9
Average of Spring Quarter	39	7	27	8	20	6	Average of Autumn Quarter	36	8	30	1	20	6

TABLE II.—*Annual Average Prices and Quantities of British Corn sold in the Towns in England and Wales from which Returns are received under the Act of* 45 *&* 46 *Vict. ch.* 37, *in each of the Years* 1881 *to* 1891.

[*From the "London Gazette."*]

Year	Wheat	Barley	Oats	Wheat	Barley	Oats
	s. d.	s. d.	s. d.	Qrs.	Qrs.	Qrs.
1881	45 4	31 11	21 9	1,738,255	1,631,504	211,444
1882	45 1	31 2	21 10	1,903,858	1,873,820	211,699
1883	41 7	31 10	21 5	2,901,146	2,575,528	408,471
1884	35 9	30 8	20 3	2,833,132	3,149,341	492,918
1885	32 10	30 2	20 7	2,739,515	2,765,500	393,042
1886	31 1	26 7	19 0	2,739,822	2,474,466	367,083
1887	32 6	25 4	16 3	2,495,124	2,589,667	309,478
1888	31 10	27 10	16 9	2,427,861	1,911,835	255,726
1889	29 9	25 10	17 9	2,945,408	3,329,814	415,783
1890	31 11	28 8	18 7	3,439,699	3,327,991	599,033
1891	37 0	28 2	20 0	3,248,743	3,255,518	561,713

TABLE III.—*Returns published pursuant to the Corn Returns Act*, 1882, *and to Act of* 6 *&* 7 *Wm. IV. for "Commutation of Tithes in England and Wales," showing what has been, during the Seven Years ending Christmas Day in each Year, the Average Price of an Imperial Bushel of British Wheat, Barley, and Oats, computed from the Weekly Averages of Corn Returns in each of the years* 1885–91.

[*From the "London Gazette."*]

Year	Average (Septennial) prices per bushel		
	Wheat	Barley	Oats
	s. d.	s. d.	s. d.
1885	5 1¾	3 11¾	2 8¼
1886	4 11	3 10	2 7½
1887	4 8½	3 8½	2 6¼
1888	4 5½	3 7½	2 5
1889	4 2¼	3 6¼	2 4¼
1890	3 11¾	3 7	2 3¾
1891	4 0½	3 5¼	2 3½

TABLE IV.—*Average Prices of Wool in each of the undermentioned Years.*[1]

Year	English				Australasian	South African
	Leicester	Half-breds	Kent	Southdown		
	Per lb. d. d.	Per lb. d. d.	Per lb. d. d.	Per lb. d. s. d.	Per lb. s. d.	Per lb. s. d.
1885	8½ to 9	8¾ to 9½	9 to 9½	9 to 1 0¼	0 10½	0 9½
1886	9 ,, 9¾	9½ ,, 10¾	9¾ ,, 10½	9½ ,, 1 0½	0 9¼	0 9¼
1887	9¾ ,, 10¼	10 ,, 11¼	10¼ ,, 10¾	10¼ ,, 1 0¾	0 10½	0 10½
1888	9¼ ,, 10	9½ ,, 10½	9½ ,, 10¼	9¾ ,, 0 11¾	0 10¼	0 9¾
1889	9¾ ,, 10½	10¼ ,, 11	10¼ ,, 10¾	10¼ ,, 1 0½	0 10¼	0 10¼
1890	10 ,, 10½	10¾ ,, 11½	10¼ ,, 11	11 ,, 1 1	0 11	0 10¼
1891	9½ ,, 10	10 ,, 11	9½ ,, 10¼	10½ ,, 1 1	0 9¾	0 9¾

[1] The prices of English wool have been calculated from the list given weekly in the *Economist* newspaper.

TABLE V.—*Summary of Agricultural Produce Statistics* (**Wheat, Barley,** *and* **Oats**) *in England, Wales, Scotland, and Great Britain, for* 1891.

WHEAT

—	Estimated Total Produce		Acreage		Estimated average Yield per Acre	
	1891	1890	1891	1890	1891	1890
	Bushels	Bushels	Acres	Acres	Bushels	Bushels
England . . .	68,694,456	69,442,417	2,192,393	2,255,694	31·33	30·79
Wales	1,461,740	1,712,541	61,590	68,669	23·73	24·94
Scotland . . .	1,971,067	2,199,526	53,294	61,973	36·98	35·49
Great Britain .	72,127,263	73,354,484	2,307,277	2,386,336	31·26	30·74

BARLEY

—	Estimated Total Produce		Acreage		Estimated average Yield per Acre	
	1891	1890	1891	1890	1891	1890
	Bushels	Bushels	Acres	Acres	Bushels	Bushels
England . . .	60,900,824	62,250,366	1,772,432	1,775,606	34·36	35·06
Wales	3,438,620	3,621,793	117,101	119,780	29·36	30 24
Scotland . . .	7,789,651	8,061,642	223,265	215,792	34·89	37·36
Great Britain .	72,129,095	73,933,801	2,112,798	2,111,178	34·14	35·02

OATS

—	Estimated Total Produce		Acreage		Estimated average Yield per Acre	
	1891	1890	1891	1890	1891	1890
	Bushels	Bushels	Acres	Acres	Bushels	Bushels
England . . .	69,786,175	72,104,031	1,672,835	1,648,153	41·72	43·75
Wales	7,698,529	8,116,344	234,055	241,199	32·89	33·65
Scotland . .	34,901,557	39,967,668	992,239	1,013,646	35·17	39·43
Great Britain . .	112,386,261	120,188,046	2,899,129	2,902,998	38·77	41·40

NOTE.—The Reports from a large number of Districts indicated that the Corn Crops generally were inferior in quality and condition, and that an unusually large proportion of grain was shed in the fields.

Table VI.—*Number and Value of Live Cattle, Sheep, and Swine imported into the United Kingdom in the undermentioned Years.*

[*From Trade and Navigation Returns.*]

—		Number			Value		
		1889	1890	1891	1889	1890	1891
					£	£	£
Oxen and Bulls	From Denmark . .	30,047	21,238	8,602	359,245	245,578	91,481
	" Spain . .	11,587	8,071	7,662	190,754	132,450	134,971
	" Canada . .	82,207	109,610	98,376	1,424,731	1,739,718	1,629,975
	" United States .	294,128	384,198	314,228	5,793,366	7,351,981	6,053,483
	" Other Countries	23,842	13,401	11,635	365,372	213,051	183,136
	Total . .	441,811	536,518	440,503	8,133,468	9,682,778	8,093,046
Cows	From Denmark. .	47,895	32,699	11,998	539,436	357,584	129,355
	" Sweden . .	2,887	1,660	293	32,409	18,551	3,366
	" Canada . .	2,237	10,859	9,148	39,342	152,580	140,655
	" United States.	262	441	667	4,285	7,234	10,386
	" Other Countries	7,085	3,487	3,208	116,913	59,229	52,335
	Total . .	60,366	49,146	25,314	732,385	595,178	336,097
Calves	From Denmark. .	10,911	22,021	6,263	39,474	79,308	22,756
	" Holland . .	41,214	33,424	34,168	160,282	143,781	126,776
	" Canada . .	144	840	765	249	1,683	1,261
	" United States .	33	7	7	111	17	17
	" Other Countries	742	637	387	3,338	2,802	1,621
	Total . .	53,044	56,929	41,590	203,454	227,591	152,431
Sheep and Lambs	From Denmark .	153,362	139,465	65,368	226,163	203,449	95,561
	" Germany. .	193,191	—	—	318,939	—	—
	" Holland . .	198,035	119,669	208,443	422,129	319,490	441,867
	" Canada . .	55,857	42,640	31,633	111,128	83,656	61,337
	" United States .	18,690	3,904	10,537	36,288	7,900	17,948
	" Other Countries	58,923	52,780	28,523	80,760	81,817	46,302
	Total . .	678,058	358,458	344,504	1,195,407	696,312	663,015
Swine	From Denmark. .	19,719	1,420	—	79,036	5,671	—
	" Holland . .	1,675	362	540	3,183	1,205	1,808
	" United States .	—	1,086	—	—	4,054	—
	" Other Countries	3,930	1,168	2	13,154	3,544	1
	Total . .	25,324	4,036	542	95,373	14,474	1,809
Total value of all kinds .		. .	. .	. .	10,360,087	11,216,333	9,246,398

TABLE VII.—*Quantities and Values of Corn, Meat, Food Products, Kingdom in the Year* 1891, *with the*

[*From Trade and*

—	Quantities 1889	Quantities 1890	Quantities 1891	Values 1889	Values 1890	Values 1891
ANIMALS, LIVING (for food):—	No.	No.	No.	£	£	£
Oxen and Bulls	441,811	536,518	440,503	8,133,468	9,682,778	8,093,046
Cows	60,366	49,146	25,314	732,385	595,178	336,097
Calves	53,044	56,929	41,590	203,454	227,591	152,431
TOTAL CATTLE	555,221	642,593	507,407	9,069,307	10,505,547	8,581,574
Sheep and Lambs	678,058	358,458	344,504	1,195,407	696,312	663,015
Swine	25,324	4,036	542	95,373	14,474	1,809
TOTAL	..	..	..	10,360,087	11,216,333	9,246,398
CORN:—	Cwt.	Cwt.	Cwt.			
Wheat	58,602,271	60,474,180	66,312,962	22,530,838	23,584,616	29,448,204
Wheat Meal and Flour	14,699,201	15,773,336	16,723,003	8,559,563	9,074,290	10,184,887
Barley	17,415,943	16,677,988	17,465,698	4,968,947	4,985,406	5,941,833
Oats	15,999,060	12,727,186	16,600,394	4,472,598	3,908,497	5,475,734
Peas	1,688,512	1,842,488	2,419,381	553,503	605,099	862,427
Beans	3,585,473	3,344,918	3,672,413	1,123,233	993,505	1,206,916
Maize	36,203,069	43,437,834	26,825,625	8,580,080	9,863,034	8,411,763
Maize Meal	24,066	57,145	55,700	19,365	30,060	39,740
TOTAL	148,217,595	154,335,075	150,075,176	50,808,127	53,044,507	61,571,504
MEAT:—						
Beef, Salted	264,542	274,726	247,759	371,580	381,734	356,022
„ Fresh	1,379,511	1,854,593	1,920,511	3,015,180	3,923,015	4,038,487
Mutton, Fresh	1,226,669	1,656,419	1,662,994	2,578,621	3,447,776	3,282,001
Bacon	3,498,144	3,790,570	3,510,209	7,287,207	6,978,061	6,650,324
Hams	977,608	1,209,446	1,204,803	2,501,484	2,869,115	2,791,437
Pork, Salted (not Hams)	269,587	254,857	226,798	390,265	341,424	296,932
„ Fresh	116,846	45,295	127,518	286,139	109,834	302,725
Meat, unenumerated—Salted or Fresh	90,982	103,881	113,357	197,017	227,572	255,898
Meat preserved otherwise than by Salting	642,857	734,811	776,261 [1]	1,632,333	1,946,195	1,888,067 [2]
Rabbits	123,774	143,641	103,685	341,483	398,098	286,981
TOTAL	8,590,520	10,068,239	9,893,895	18,601,309	20,622,824	20,148,874

[1] Beef, 526,711 cwt.; mutton, 92,597 cwt.; other sorts, 156,953 cwt.
[2] Beef, 1,210,293*l.*; mutton, 220,737*l.*; other sorts, 457,037*l.*

and Articles affecting Agriculture, imported into the United Corresponding Figures for 1889 *and* 1890.

Navigation Returns.]

—	Quantities 1889	Quantities 1890	Quantities 1891	Values 1889	Values 1890	Values 1891
DAIRY PRODUCE :—	Cwt.	Cwt.	Cwt.	£	£	£
Butter	1,927,469	2,027,717	2,135,607	10,243,728	10,598,848	11,591,181
Margarine	1,240,760	1,079,996	1,235,430	3,652,722	3,083,731	3,558,203
Cheese	1,909,545	2,144,074	2,041,317	4,494,554	4,975,234	4,815,369
TOTAL	5,077,774	5,251,787	5,412,354	18,391,004	18,657,813	19,964,753
POULTRY, &c. :—						
Poultry and Game, alive or dead	—	—	—	472,686	497,858	456,979
	Gt. Hunds.	Gt. Hunds.	Gt. Hunds.			
Eggs	9,416,639	10,291,246	10,681,137	3,122,813	3,428,802	3,520,918
TOTAL	—	—	—	3,595,499	3,926,660	3,977,897
FRUIT, VEGETABLES, &c. :—	Bushels	Bushels	Bushels			
Apples (raw)	3,617,997	2,574,957	3,147,373	976,118	786,072	1,033,997
Fruit, unenumerated (raw)	2,189,508	3,584,668	3,490,211	1,149,834	1,806,811	1,762,406
Onions	3,862,751	3,871,195	4,281,046	674,547	724,020	733,845
	Cwt.	Cwt.	Cwt.			
Potatoes	1,864,610	1,940,100	3,192,836	735,999	714,257	1,196,824
Vegetables, unenumerated (raw)	—	—	—	623,789	773,590	932,887
Hops	200,690	188,026	195,264	716,637	877,704	980,045
TOTAL	—	—	—	4,876,924	5,682,454	6,640,004
OTHER ARTICLES :—	Cwt.	Cwt.	Cwt.			
Lard	1,193,831	1,273,236	1,051,284	2,178,408	2,091,704	1,720,051
Flax	1,783,189	1,800,469	1,681,225	3,066,114	2,856,276	2,775,189
	Lb.	Lb.	Lb.			
Wool, Sheep and Lambs'	696,396,186	630,236,298	715,470,802	28,393,755	26,945,057	27,856,556
Wood & Timber :	Loads	Loads	Loads			
Hewn	2,389,491	2,278,374	2,251,577	5,635,118	5,004,554	4,508,787
Sawn or Split, Planed or Dressed	5,318,750	4,778,314	4,378,452	13,142,333	11,092,221	9,379,808
Staves	170,155	155,995	130,101	694,115	669,243	590,543
	Tons	Tons	Tons			
Oil-Seed Cake	256,296	280,616	270,671	1,703,521	1,743,279	1,843,286
	Cwt.	Cwt.	Cwt.			
Seeds: Clover and Grass	296,314	379,589	256,920	608,097	758,294	552,977
	Tons	Tons	Tons			
" Cotton	289,413	314,050	350,445	1,940,995	1,749,215	2,047,747
	Qrs.	Qrs.	Qrs.			
" Flax and Linseed	2,272,019	1,932,035	2,200,112	4,577,799	3,949,104	4,564,569
" Rape	458,948	230,547	261,169	820,273	416,377	388,446
TOTAL	—	—	—	62,760,528	57,275,324	56,227,959

TABLE VIII.—*Quantity and Value of Dead Meat imported into the United Kingdom in the Four Years, 1888–91.*

[*From Trade and Navigation Returns.*]

Thousands ("000") omitted.

DEAD MEAT	1888		1889		1890		1891	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
	Cwt.	£	Cwt.	£	Cwt.	£	Cwt.	£
BACON :— From United States	1,866	3,853	2,548	4,810	2,935	4,891	2,675	4,518
„ Other Countries	989	2,540	950	2,477	856	2,087	835	2,132
Total	2,854	6,393	3,498	7,287	3,791	6,978	3,510	6,650
BEEF :— Salted — From United States	213	325	254	352	263	359	235	335
„ Other Countries	13	24	11	19	12	23	13	21
Total	226	349	265	371	275	382	248	356
Fresh — From United States	785	1,815	1,270	2,812	1,693	3,630	1,747	3,745
„ Other Countries	52	106	110	203	161	293	173	293
Total	837	1,921	1,380	3,015	1,854	3,923	1,920	4,038
HAMS :— From United States	647	1,697	873	2,217	1,094	2,584	1,117	2,580
„ Other Countries	81	227	104	284	115	285	88	211
Total	728	1,924	977	2,501	1,209	2,869	1,205	2,791
MEAT, Unenumerated :— Salted or Fresh — From United States	3	6	22	48	17	32	20	40
„ Other Countries	54	114	69	149	87	195	93	216
Total	57	120	91	197	104	227	113	256
Preserved, otherwise than by Salting — Beef [1]	..	..	..	..	551	1,424	527	1,210
Mutton [1]	..	..	..	..	79	182	92	221
Other Sorts [1]	..	..	..	..	105	340	157	457
Total	543	1,377	643	1,632	735	1,946	776	1,888
MUTTON, Fresh :— From Holland	88	190	78	175	116	275	57	128
„ Australasia	543	1,104	613	1,292	897	1,823	1,063	2,109
„ Argentine Republic	347	628	395	750	435	823	436	791
„ Other Countries	11	19	141	362	208	527	107	254
Total	989	1,941	1,227	2,579	1,656	3,448	1,663	3,282
PORK :— Salted or Fresh (not Hams) — From United States	150	238	192	283	205	282	170	234
„ Other Countries	338	679	194	393	95	169	184	366
Total	488	917	386	676	300	451	354	600
RABBITS :— From Belgium	92	250	113	309	129	357	84	234
„ Other Countries	9	26	11	32	14	41	20	53
Total	101	276	124	341	143	398	104	287
TOTAL OF DEAD MEAT	6,823	15,218	8,591	18,601	10,068	20,623	9,893	20,149

[1] Not separately enumerated prior to 1890.

TABLE IX.—*Quantities and Values of Butter, Margarine, Cheese, and Eggs imported into the United Kingdom in each Year from* 1889 *to* 1891 *inclusive.*

[*From Trade and Navigation Returns.*]

—	QUANTITIES			VALUES		
	1889	1890	1891	1889	1890	1891
BUTTER	Cwt.	Cwt.	Cwt.	£	£	£
From Sweden	212,141	224,235	234,987	1,141,218	1,175,722	1,269,187
„ Denmark . . .	677,491	824,749	876,211	3,743,576	4,422,257	4,865,840
„ Germany . . .	111,027	104,450	115,509	588,660	544,271	615,791
„ Holland . . .	151,073	156,069	146,539	767,457	792,786	770,460
„ France	566,524	525,105	535,196	3,073,473	2,847,144	3,038,063
„ Canada	22,634	15,155	46,267	95,167	60,739	187,392
„ United States .	110,187	84,553	63,693	448,825	322,385	251,750
„ Other Countries .	76,392	93,401	117,205	385,352	433,544	592,698
Total	1,927,469	2,027,717	2,135,607	10,243,728	10,598,848	11,591,181
MARGARINE	Cwt.	Cwt.	Cwt.	£	£	£
From Norway	11,051	15,084	26,466	33,399	45,578	77,863
„ Holland . . .	1,137,094	1,001,968	1,104,050	3,280,628	2,804,675	3,093,595
„ France . . .	59,245	44,331	69,016	231,546	175,383	263,574
„ Other Countries .	33,370	18,613	35,898	107,149	58,095	123,171
Total	1,240,760	1,079,996	1,235,430	3,652,722	3,083,731	3,558,203
CHEESE	Cwt.	Cwt.	Cwt.	£	£	£
From Holland	327,384	292,215	307,925	807,037	723,105	763,387
„ France	32,941	40,364	43,748	106,057	127,832	138,486
„ Canada	675,900	837,890	857,841	1,565,526	1,914,232	1,991,597
„ United States .	827,626	919,408	774,893	1,899,864	2,081,546	1,779,260
„ Other Countries .	45,694	54,197	56,910	116,070	128,519	142,639
Total	1,909,545	2,144,074	2,041,317	4,494,554	4,975,234	4,815,369
EGGS	Great Hundreds	Great Hundreds	Great Hundreds	£	£	£
From Russia	620,948	1,059,239	1,439,954	165,740	287,157	383,791
„ Denmark . . .	946,714	1,145,258	1,161,174	286,917	359,759	395,963
„ Germany . . .	2,998,865	2,915,491	2,714,028	893,902	868,655	781,903
„ Belgium . . .	1,817,353	1,927,477	1,765,441	565,057	585,032	539,666
„ France	2,950,566	3,089,255	3,119,754	1,181,335	1,270,092	1,259,099
„ Other Countries .	82,193	154,526	480,786	29,862	58,107	160,496
Total	9,416,639	10,291,246	10,681,137	3,122,813	3,428,802	3,520,918

TABLE X.—*Value of Corn imported into the United Kingdom in each of the Seven Years* 1885–91.

[*From Trade and Navigation Returns.*]

	1885	1886	1887	1888	1889	1890	1891
	£	£	£	£	£	£	£
Wheat . . .	24,066,013	17,888,155	21,335,902	21,971,331	22,530,838	23,584,616	29,448,204
Wheat Flour .	9,651,508	8,254,407	10,020,433	9,530,800	8,559,563	9,074,290	10,184,887
	33,717,521	26,142,562	31,356,335	31,502,131	31,090,401	32,658,906	39,633,091
Barley . . .	4,528,823	3,968,437	3,769,272	6,069,190	4,968,947	4,985,406	5,941,833
Oats . . .	4,252,135	3,974,434	3,489,818	4,588,712	4,472,598	3,908,497	5,475,734
Maize . . .	8,473,863	7,614,113	7,535,946	6,881,307	8,580,080	9,863,034	8,411,763
Maize Meal . .	18,811	12,899	4,934	8,046	19,365	30,060	39,740
Beans and Peas .	1,758,105	1,512,985	1,662,992	1,625,835	1,676,736	1,598,604	2,069,343
Total of Corn	52,749,258	43,225,430	47,819,297	50,675,221	50,808,127	53,044,507	61,571,504

TABLE XI.—*Quantities of Wheat, Wheat Meal, and Flour imported into the United Kingdom in the Five Years* 1887–91 ; *also the Countries from which they were obtained.*

[*From Trade and Navigation Returns.*]

(Thousands ("000") omitted.)

	1887	1888	1889	1890	1891
	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.
Wheat from—					
Russia	5,523	21,369	21,322	19,389	14,553
Germany	1,552	3,265	2,539	1,101	714
France	71	20	127	½	126
Turkey	2	182	667	900	1,510
Roumania	585	1,419	2,862	4,654	1,088
Egypt	198	730	325	425	937
United States.	30,505	14,647	17,016	17,201	24,195
Chili	2,206	1,486	573	24	2,120
British India	8,509	8,189	9,217	9,112	13,006
Australasia	1,347	2,316	1,406	3,058	2,086
British North America .	3,965	1,089	1,168	1,128	3,174
Other Countries	1,322	2,513	1,380	3,482	2,804
Total Wheat . . .	55,785	57,225	58,602	60,474½	66,313
Wheat Meal and Flour from—					
Germany	589	1,109	1,155	895	365
France	98	102	91	103	44
Austrian Territories . .	1,391	1,946	1,838	1,370	1,218
United States.	14,873	12,557	10,068	12,026	13,703
British North America .	959	785	1,169	933	1,029
Other Countries	147	414	378	446	364
Total Wheat Meal and Flour . . .	18,057	16,913	14,699	15,773	16,723

TABLE XII.—*Number of Horses, Cattle, Sheep, and Pigs imported into Great Britain from Ireland in each Year from* 1884–90.

[*From Agricultural Returns.*]

——	1884	1885	1886	1887	1888	1889	1890
HORSES:							
Stallions . . .	74	64	43	68	67	80	105
Mares	10,722	11,603	12,497	11,801	12,388	13,647	14,625
Geldings . . .	16,290	16,496	16,239	15,769	17,373	18,097	19,422
Total . .	27,086	28,163	28,779	27,638	29,828	31,824	34,152
CATTLE:							
Oxen, Bulls and Cows: Fat . .	255,026	243,348	285,156	331,119	282,537	248,362	216,339
Oxen, Bulls and Cows: Store. .	387,352	342,938	388,917	302,878	405,540	372,682	360,758
Oxen, Bulls and Cows: Other cattle .	2,220	1,884	1,247	2,283	2,941	1,432	1,152
Calves	71,245	52,300	42,069	32,973	47,698	47,367	53,449
Total. . .	715,843	640,470	717,389	669,253	738,716	669,843	631,698
SHEEP:							
Sheep	355,466	430,410	493,983	321,644	400,836	373,313	387,220
Lambs	177,819	198,680	240,230	226,924	236,748	240,374	249,761
Total. . .	533,285	629,090	734,213	548,568	637,584	613,687	636,981
PIGS:							
Fat	437,227	370,639	391,509	438,155	495,680	428,103	543,417
Store.	19,451	27,925	29,776	42,765	49,292	45,448	59,745
Total . .	456,678	398,564	421,285	480,920	544,972	473,551	603,162

TABLE XIII.—*Number of Horses, and their Declared Value, imported into, and exported from, the United Kingdom, in each of the undermentioned Years.*

[*From Agricultural Returns and Trade and Navigation Returns.*]

Year	IMPORTED		Year	EXPORTED	
	Number	Value		Number	Value
		£			£
1887	11,641	197,679	1887	9,463	547,396
1888	11,505	192,624	1888	12,880	848,311
1889	13,832	277,388	1889	14,266	984,611
1890	19,286	335,906	1890	12,916	687,978
1891	21,715 [1]	436,128	1891	11,238	625,041

[1] NOTE.—The countries from which horses were *imported* in 1891 were as follows:—Germany, 11,539; Denmark, 2,199; Holland, 1,304; France, 841; Belgium, 636; United States of America, 590; Canada, 1,058; and 3,488 from other countries.

TABLE XIV.—*Quantities of Certain Articles of Foreign and Colonial Production imported into the United Kingdom in the Years* 1888–91.

[*From Trade and Navigation Returns.*]

——	1888	1889	1890	1891
Bones (whether burnt or not) tons	65,651	62,855	69,949	82,945
Cotton, Raw . . . . cwt.	15,246,408	17,159,316	16,011,350	17,811,476
Guano . . . . . . tons	25,052	26,804	28,005	23,623
Hemp . . . . . . cwt.	1,822,065	1,973,210	1,890,367	2,055,382
Hides untanned: Dry . "	585,254	575,158	455,098	453,268
" " Wet . "	576,176	647,250	584,948	555,692
Petroleum . . . . gallons	94,177,807	102,647,478	104,809,146	130,615,360
Flax-seed and Linseed . qrs.	2,542,027	2,272,019	1,932,035	2,200,112

TABLE XV.—*Number of Carcasses of Frozen Mutton imported into the United Kingdom from the Countries named in each of the Years* 1880 *to* 1891.

[*From Messrs. W. Weddel & Co.'s "Review of the Frozen Meat Trade,* 1891,' *corrected to date.*]

Year	From New Zealand	From Argentine Republic	From Australia	From Falkland Islands	Totals
1880	—	—	400	—	400
1881	—	—	17,275	—	17,275
1882	8,839	—	57,256	—	66,095
1883	120,893	17,165	63,733	—	201,791
1884	412,349	108,823	111,745	—	632,917
1885	492,269	190,571	95,051	—	777,891
1886	655,888	434,699	66,960	30,000	1,187,547
1887	766,417	641,866	88,811	45,552	1,542,646
1888	939,231	924,003	112,214	—	1,975,448
1889	1,068,286	1,009,936	86,547	—	2,164,769
1890	1,533,393	1,196,531	207,984	10,168	2,948,076
1891	1,896,706	1,112,618	334,693	18,897	3,362,914

TABLE XVI.—*Home Product and Importations of Sheep and Mutton (United Kingdom) in each Year from* 1883 *to* 1891.

Year	Population at the middle of each year	Number of sheep and lambs enumerated annually in June (from *Agric. Returns*)	Number assumed to be slaughtered annually, *i.e.* 40 per cent. of those enumerated	Number of live sheep imported in each year	Number of carcasses of frozen mutton imported in each year
1883	(estimated) *35,612,000*	28,348,000	11,339,200	1,116,000	201,791
1884	,, *35,962,000*	29,377,000	11,750,800	945,000	632,917
1885	,, *36,325,000*	30,086,000	12,027,200	751,000	777,891
1886	,, *36,707,000*	28,955,000	11,582,000	1,039,000	1,187,547
1887	,, *37,092,000*	29,402,000	11,760,800	971,000	1,542,646
1888	,, *37,454,000*	28,939,000	11,575,600	956,000	1,975,448
1889	,, *37,809,000*	29,485,000	11,794,000	678,000	2,164,769
1890	,, *38,187,000*	31,667,000	12,667,000	358,458	2,948,076
1891	(census) 37,740,283	33,534,000	13,414,000	344,504	3,362,914

"From the foregoing," say Messrs. Weddel, "it may be gathered that Frozen Mutton importations now represent from 15 to 20 per cent. of the total consumption of mutton in the United Kingdom."

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OF ENGLAND.

VERMIN OF THE FARM.

It is by no means easy to give such a definition of "vermin" as will satisfy everyone. The agriculturist is not necessarily a game preserver, and in that case his views will scarcely coincide with those of the sportsman, whose chief concern is with the amount of game he can rear for the pleasure of shooting it. He who farms only for profit on land over which the sporting rights are reserved will naturally care more for the protection of his own crops than for the protection of game; and, indeed, if he considers the matter seriously, he will be indifferent to the presence on his farm of any so-called "vermin" so long as it is not destructive to agricultural produce. It follows that a list of vermin drawn up by the farmer will not coincide with that of the sportsman, and that man will have the longest list who farms his own land and reserves the shooting.

The interpretation usually given by lexicographers to the word "vermin" is "any small obnoxious insect or animal;" and the form of the word, cognate with *vermis*, a worm, suggests that the creatures so called are not only small, but creeping or crawling. Assuming this to have been the orignial signification of the word, it has come to be very widely extended, and at the present day is by many people deemed to include nearly all the smaller British mammals, from the harvest-mouse to the polecat (and even in some places the badger and the fox), as well as a great variety of so-called "winged vermin," such as crows, jays, magpies, hawks and owls.

To determine which of all these merit the persecution

which they receive, and which stand in need of protection, is a difficult question, and one which can only be answered after a careful study of the creatures' habits, and close inquiry into the nature of their food.

For practical purposes, the vermin of the farm may be divided into four groups—namely (1) the graminivorous rodents; (2) the insectivorous mole and the hedgehog (the shrews being harmless); (3) the carnivorous destroyer of poultry and other live stock; and (4) the so-called winged vermin, which are more or less omnivorous in their habits.

Amongst the species proposed to be dealt with in this connection will be found some, like the mole and hedgehog, which many persons are disposed to regard with favour on account of services rendered by them to the agriculturist, and which are held to counterbalance any harm they may do. These, it may be observed, are placed on the list of vermin tentatively, in order that their merits and demerits may be impartially examined. The writer's aim will be to state as briefly as may be, from personal observation, or from trustworthy evidence, the nature of the depredations committed by these so-called "vermin," the kind of food upon which each chiefly subsists, and the best means of getting rid of those which are most destructive to agricultural produce and growing trees.

At the head of the first-named group should undoubtedly be placed the brown rat (*Mus decumanus*), and since this animal might with equal propriety be placed at the head of the third group, on account of its depredations among young ducks, chickens, eggs, &c., it may truly be regarded as the greatest of all farm pests.

The brown rat, house-rat, barn-rat, Norway, or Hanoverian rat, as it is variously styled, is too well known in appearance to most people to require any particular description, and for this reason its portrait may be dispensed with. It is now so generally distributed in all parts of the world, chiefly by means of merchant ships carrying cargoes, that it is impossible to state with any degree of certainty from what particular country it first came to us. Bell states it was doubtless brought hither by means of merchant vessels from some southern or south-eastern country; Pennant imagines from the East Indies. It certainly was known in Asia long before we have any account of its existence in any part of Europe, and its transit from the Asiatic borders into European Russia was well ascertained.

The Russian naturalist, Pallas, states that it crossed the Volga from Central Asia in large troops in 1727, peopled Russia, and subsequently spread over the whole of Europe.

According to Erxleben, it reached England in 1730, and France in 1750.

Waterton affirms that the first seen in England arrived in a ship from Germany some few years after the fateful period of 1688. "There is a tradition," he says,[1] "that it actually came over in the same ship which conveyed the new dynasty to these shores. My father, who was of the first order of field naturalists, was always positive on this point; and he maintained firmly that it did accompany the House of Hanover in its emigration from Germany to England." Be this as it may, the brown rat is now so firmly established as to well-nigh defy all attempts at its extermination.

The chief causes favourable to its continued existence are two: its extremely prolific nature, and the variety of its food. Eight or ten young ones at a birth, several times a year, show a most alarming increase, greater even than in the case of the rabbit, which, though breeding as often in the year, produces fewer young at a birth. Rats will breed when only half grown, but in this case will produce only three or four at a birth. As regards the variety of the food on which they subsist, if one kind should fail, another is at once made available, so that unlike some other animals it is practically impossible for rats to starve. Grain of all kinds, meal, dog-biscuit, carrots, turnips, truffles, the bark of fruit-trees, fruit, eggs, chickens, ducklings, pigeons, young rabbits, and even moles,[2] all form items in the long bill of fare of this omnivorous animal.

A propos of its taste for dog-biscuit, a curious incident is narrated by Mr. T. W. Kirk, of the Colonial Museum, Wellington, New Zealand:—

"I was standing" (he says) "in the doorway of a large shed, the further end of which had been partitioned off with bars to form a fowl-house, when I was attracted by a gnawing and scraping noise. Turning round I saw a rat run from a large dog-biscuit which was lying on the floor and pass through the bars. Being curious to watch if he would return, I kept quiet, and presently saw a well-grown specimen of the common brown rat (*Mus decumanus*) come cautiously forward, and after nibbling for a short time at the biscuit, drag it toward the bars, which are only two inches apart, and would not allow the biscuit to pass. After several unsuccessful attempts he left it, and in about five minutes returned with another rat, rather smaller than himself. He then came through the bars, and, pushing his nose under the biscuit, gradually tipped it on edge, rat number two pulling vigorously from the other side; by this means they finally succeeded in getting a four-inch biscuit through a two-inch aperture. Not feeling pleased that my dog's

[1] *Essays on Natural History*, 1st series, p. 211.

[2] An instance is known to us in which a rat was shot in the act of carrying off a half-grown mole in its mouth.

biscuits should be used as food for rats, I threw a hammer at them, and picked up the biscuit.

"I think the conduct of these animals showed a wonderful amount of intelligence; it was evident that the first rat saw that, to get the biscuit through the bars, it was necessary that it should be on its edge, and, not being able to tip it and pull at the same time, he gained the assistance of a friend.

"The short space of time during which he was absent, and the concerted action, show also that they must have some wonderfully facile means of communicating ideas."[1]

In regard to the damage done by rats to fruit-trees, the reader may be reminded of an observation made by the late Edward Jesse in his very entertaining *Gleanings in Natural History*. He says:—

"I was lately shown a pear-tree trained against an outhouse in the yard of a gentleman at Hampton Court, all the upper part of which had been eaten away by rats. They descended from the projecting eaves of the building on the branches of the pear-tree, and as far as they could reach had fed on the leaves and tender shoots of the tree. They were frequently seen in the act of feeding, and the tree indeed showed evident marks of their depredations."[2]

The same observer has remarked:[3]—

"The fact of rats being able to remove eggs from one place to another without breaking them seems to be pretty well ascertained. I was assured that on one occasion they had taken them from a box in which they had been placed. It is not easy to guess how they contrive to do either the one or the other."[4]

Rats will not only prey upon other animals as big, or even bigger, than themselves—as, for example, rabbits[5]—but will even kill and devour their own kind. Those caught in gins will be set upon by others, killed, and demolished all but the skin; and one of the first things a rat does when caught in a trap by one of its legs is to twist and gnaw off its own leg to get free. This has been observed repeatedly.

Rats will also eat snails, which they carry into their runs to devour at leisure, leaving the fragments of shells in testimony of the fact. They have even been seen to climb up the stalks of hollyhocks, clear off several snails at a time, bring them down with one paw, like an armful, and run off with them on three legs to a hole. On examination of the holes, the inside was found to be strewn for some distance with broken snail shells.[6]

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[1] *Nature*, September 10, 1884.

[2] First series, p. 183.

[3] See further about Rats, and Rat lore, a paper in the *Quarterly Review*, by A. Wynter. Vol. 101. 1857.—Ed.

[4] *Op. cit.* second series, p. 281.

[5] Several instances of rats killing and eating rabbits will be found reported in *The Field* of June 29, 1872, and July 27, 1878.

[6] Merrifield, *Sketch of the Natural History of Brighton*, p. 157; and Harting, *Rambles in Search of Shells*, p. 73.

They also take pond-snails. The leaves of water-lilies may sometimes be seen covered with fragments of snail shells interspersed with rats' dung. This is the work of the brown rat, and not the water-vole.

A more unusual divergence of habit in the rat is its occasional indulgence in fishing. Its fondness for fish is, of course, well known to sea fishermen and fish merchants; but perhaps few people are aware that it will catch young eels and bring them ashore like an otter. Here is the statement of an eye-witness of such a feat, Mr. James Hardy, of Gateshead-on-Tyne:—

"On February 24, taking a walk with a companion, as we went along the side of the mill race at Swalwell, near Newcastle-upon-Tyne, we noticed a common house-rat making its way close by the edge of the water among the coarse stones that formed the embankment. Curious to know what it could be doing there, we watched its progress downwards, until it reached the outlet of a drain, into which it had just turned, when it gave a sudden plunge, and as quickly reappeared in the stream with a middling-sized eel in its mouth. It made for the edge, where it soon regained its footing; and this, from the steepness of the bank, was a matter of difficulty, which was much increased by the eel, which it had seized a little above the tail, and was struggling vigorously to get free. The desperate efforts of the eel rendered his footing so precarious, that, rather than have a plunge for nothing, he was reluctantly obliged to drop it into the water. His first action afterwards was to give himself a good shake, both to revive his spirits and to rid his coat from the effects of his morning dip; and then, as before, he resumed his 'contemplative recreation.'"

Rats swim well, and not only think nothing of crossing any water which comes in their way when migrating, but during the summer months, when numbers quit the villages and farm-buildings to live an open-air life until the cold weather drives them back again, they may often be seen about the banks of streams, into which they will plunge without hesitation if suddenly alarmed. But if prevented from landing when swimming they soon get exhausted and drowned. Now and then, when crossing water in the winter time, they get caught by the too rapid formation of ice.[1]

About ten years ago (1881), when the dry dock inside the old pier at Penzance was in course of construction, it was remarked that the pier, being hollow-built, was full of rats. As the ground was being prepared, the receding tide left shallow pools full of small prawns, and the rats were seen catching these with great dexterity.

These instances will serve to show the very varied nature of the rat's food, and the extensive character of its depredations.

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[1] *Zoologist*, 1861, p. 7376.

It would not be difficult to add to its list of misdeeds, but a single addition must suffice. From repeated observations made in the woodlands of Sussex, extending over several years, the writer has come to regard the brown rat not only as one of the worst enemies of the game-preserver, but as the means very often of bringing unoffending creatures to death. He is a great devourer of pheasants' food (to say nothing of young pheasants), and when the latter are gathered under the foster hen at sundown, the rat may be seen issuing stealthily into the grass ride, where the food has been scattered, helping himself to all he can find. This is the opportunity for the brown owl to render important service. Gliding off the low branch of a tree in the direction of the pheasant coops, the bird swiftly and noiselessly approaches, and a rat is carried off ere he has time to realise the presence of an enemy. Many a keeper, seeing an owl near the coops, shoots or traps it as soon as possible, alleging that it is after the young pheasants; quite unmindful of the fact that they are then under the brood hen, and that the owl, by keeping down the rats, is saving him bushels of pheasants' food.

How to rid the farm buildings, stacks, hedgerows, and game-coverts of this pest is a question of no slight importance.

The method to be adopted must depend upon the nature of the place infested, for what will answer in one place will not do in another. Rats are extremely cunning, and some little experience of their habits is necessary to outwit them. If they infest buildings, it is important first to discover where they chiefly lie before any traps are set.[1] This may be ascertained by sifting fine sand in their suspected runs, and so tracking their footsteps. The next thing is to feed them regularly for some nights before attempting to catch any; and, thirdly, to bear in mind that an unbaited trap is often more effective than a baited one if rightly placed, and that a small gin, or spring-trap, if pegged down so that it cannot be carried off, is much better than a larger and heavier one.

If a live-trap be used, there is no better pattern than that

[1] Their sleeping and nesting places are often at some distance from where they feed. In a house at Basingstoke, connected with a large malthouse by a range of buildings, rats were frequently heard passing downwards from the roof to the basement between the battening and the walls, but they never got into the house itself. The question was, why did they come at all? At last a hearthstone was taken up in an office on the ground-floor, and a bushel or so of pieces of paper was found in which the nests had been made. By a comparison of the fragments, it was found that every scrap of this paper had been carried over one hundred yards from a store where old papers are kept, over roofs, through small holes, along gutter pipes and drains, and under floors of the house to make a nest in a warm place far away from any food supply.—*The Field*, July 17, 1886.

recommended upwards of a century ago by a celebrated ratcatcher, Robert Smith, who wrote a quaint little book on the subject, and described himself on the title-page as "Ratcatcher to the Princess Amelia."[1]

This is a box or hutch-trap, opening at both ends, and so much more inviting when daylight can be seen through it than a trap would be if open at one end only. So successful was the veteran Robert Smith with this form of trap that he tells us he has caught as many as seventy-two rats in one night; not with one trap, of course, but with several traps of this one pattern, judiciously placed, after finding the most frequented haunts, and after a few nights' feeding *in the traps*, which were kept open and prevented from closing by the insertion of wooden pegs at the end.

A more modern plan, and a very simple one, which may be adopted in-doors or out, is the following, which has the merit of being both cheap and effective:—

> Cover a barrel with stiff, stout paper, tying the edge around the barrel; place a board so that the rats may have easy access to the top; sprinkle cheese-parings or other "feed" for the rats on the paper for several days, until they begin to believe that they have a right to their daily rations from this source; then place in the bottom of the barrel a piece of rock, about six inches or seven inches high, filling with water until only enough of it projects above the water for one rat to lodge upon. Now replace the paper, first cutting a cross in the middle, and the first rat that comes on the barrel-top goes through into the water, and climbs on the rock. The paper comes back to the place, and the second rat follows the first. Then begins a fight for the possession of the dry place on the stone, the noise of which attracts the rest, who share the same fate.

The time for out-of-door trapping is during the summer months when the rats live a good deal in the open air. Here again a little attention to their habits will ensure success. It should be noted that in travelling, rats usually seek concealment; thus they will run along the base of a wall in preference to crossing an open space. If a slanting board be placed so as to leave a covered way between it and the wall, the rat will run under it. By setting small unbaited gins in these places they are almost certain to be caught. When the rats are coming in from the fields, their runs should be carefully looked for, and

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[1] *The Universal Directory for taking alive and destroying rats and all other kinds of four-footed and winged Vermin in a method hitherto unattempted: calculated for the use of the Gentleman, the Farmer and the Warrener.* By Robert Smith, Ratcatcher to the Princess Amelia. London. Printed for the author, MDCCLXVIII. A description of the dress of the royal ratcatcher has been preserved by Pennant, who states, in his *British Zoology* (ed. 1812, vol. i. p. 142): "Among other officers, his British Majesty has a ratcatcher, distinguished by a particular dress, scarlet embroidered with yellow worsted, on which are figures of mice destroying wheatsheaves."

boards, tiles, or slates placed, as it were accidentally, against the walls, under which they will pass, when small gins underneath will be fatal. The strongly made gins usually employed are far too large and clumsy to be set in narrow runs. To be of the right size they should weigh about four ounces, and measure as follows; entire length 7½ in., gape of the jaws, when open, 2¼ in., their length 2 in. The cost from 4d. to 6d. each. These are small enough to catch a mouse and strong enough to hold a polecat.

If poison[1] be preferred on the score of humanity, the following recipe, recommended by Waterton, will be found efficacious:—

Take a quantity of oatmeal that would fill a common-sized washhand basin: add to this 2lb. of coarse brown sugar and one dessert-spoonful of arsenic. Mix these ingredients very well together, and then put the composition into an earthen jar. From time to time place a table-spoonful of this in the runs which the rats frequent, taking care that it is out of the reach of innocuous animals. The rats will partake of it freely, and it will soon put an end to all their depredations.

When a rat kills a pigeon, or chicken, it rarely eats more than a portion, and it is easy to poison the portion remaining and so secure the rat on his return for a second meal. If poisoned with arsenic, or any other irritating poison, it is as well to put shallow vessels of water within reach; for the rats, consumed with thirst, will come to drink at them and die there instead of in their holes, where their decomposing bodies would subsequently create a stench.

Should a rat perchance die behind the wainscot, or under the floor of a room, where from the difficulty of ascertaning its exact position it cannot well be removed, and where in warm weather it would become very unpleasant, it is a good plan to catch a few bluebottle flies, and, closing door and window, turn them loose in the room. In a short time they will settle down above the spot where the rat is lying, and the latter may then be removed with the least possible trouble.

Mr. T. A. Abbott, writing from Sussex in *The Field* of October 3, 1891, has suggested a method by which he thinks corn—standing in stacks in the fields and elsewhere—can be efficiently protected from rats, and when corn has been carted and stacked in such condition that it cannot be profitably threshed and marketed till the following spring, its protection becomes a matter of more than ordinary importance:—

"Around our wheat stacks," he says, "we have placed corrugated iron, set on end and lapped. The sheets are the ordinary 6ft. by 2ft. quality, cut in halves, making two 3ft. lengths. These small sheets are let into the

[1] In vol. iii. 1st series, p. 428 of the Journal, there is a paper by J. S. Carr on 'Rats and Mice, and Mode of their Destruction.' A preparation of phosphorus is recommended—now the common phosphorus paste of commerce.—Ed.

ground 6in., in an upright position, forming a close fence 2ft. 6in. high round the stack. To prevent its being blown down, a short stake is driven into the ground on the inner side at each joint, and a wire nail driven into the stake and bent over the edges of the iron plates.

"I noticed round one of our stakes that the marauders had made a padded road outside the iron fence, but there was no sign that the rampart had been scaled. The iron sheets are placed 4ft. from the bottom of the stack. At first sight this fence may appear expensive; but it is practically everlasting, if care be taken of the sheets. Considering the damage which is done to corn in a stack infested by rats and mice, besides what they eat, I do not think it is a bad investment. I do not know if this plan has been adopted before; but, from the interest everyone takes in it who has seen it, I should think it may be new, and, I hope, useful to many."

To this the Editor appended the following note:—

["The plan above described is not new as regards England, although it may possibly be so as regards Sussex. It is a good method of keeping rats and mice out; but of no use (rather the reverse, by excluding old buck rats and weasels) when any vermin have got in. This is sure to happen, unless almost daily supervision is practised to see that no rake, fork, or bit of timber is left standing and leaning up against the stack, serving as a staircase by which rats and mice can enter. It is also desirable to turn down a fold—not less than 3in. wide—and put this at the underground end, tending outwards. This prevents the rats from digging and making a thoroughfare under the iron sheets, which they will do (and enter by it) in a single night. Coming to the buried edge, they are baffled, and they have not intelligence enough to begin again sufficiently far back to undermine that. Still, protection of this kind has frequently proved effectual to stacks, when carefully done at first and looked after.—Ed."]

To get rid of rats in a poultry yard it is a good plan to make some chloride of lime into a thick paste, and smear the rats' runs with it. Or chloride of lime mixed with water in a large watering-can may be poured into their holes. A strong solution of carbolic acid may also be employed in a similar way.

Finally there is a plan which most people seem very unwilling to try, namely to abstain from killing the natural enemies of the rat—weasels, stoats, polecats, kestrels, owls, and buzzards.

The elongated form, slender body, and short legs of all the weasel tribe especially fit them for following such vermin as rats and mice in their retreats, while their activity and strength, and large and powerful canine teeth enable them to overtake and kill them frequently with ease, though sometimes not without a terrible struggle. We have watched with breathless interest a single-handed combat between a stoat and a large rat very much heavier than itself. The fight took place in the middle of a dusty road across a common over which the rat was passing when the stoat sprang at his throat. It was an anxious moment as the two rolled in mortal conflict on the hard road, on which they raised a cloud of dust. From the superior weight

of the rat it looked at first as if he would shake off his opponent and fling him easily aside; but the stoat clung with such tenacity to the rat's neck, that it was impossible to dislodge him; the efforts of the rat got weaker and weaker, and finally he sank to the ground, and with a few convulsive kicks succumbed to the brave little stoat, who, with open mouth and panting sides, like a little dog, stood over him in triumph. After a short interval the rat was again seized and half-carried, half-pushed, off the road into the furze-clad common, where we left the victor in peace to enjoy his well-earned supper.

But it may be said, are not stoats and weasels vermin? Do they not destroy poultry, game, and many other things besides rats? and if so, ought they not to be themselves destroyed? It is a choice of evils. No one who has had any opportunity of studying the habits of stoats will pretend for a moment that they confine their attention to rats. They are very fond of young rabbits, and we have seen them bolting them from their burrows like a ferret, but we have more often seen them carrying field-mice in their mouths (just as a retriever carries a rabbit), and have come to the conclusion that rats and mice are their natural prey, and that they would kill numbers of them if they were not trapped, or shot, as soon as they show themselves near the buildings, or stacks, in which the rats and mice have their strongholds.

The gradual decrease of the so-called old English black rat (*Mus rattus*) in this country has long been noted. So far back as 1768 the royal ratcatcher, to whom allusion has been already made (p. 211 *note*) remarked a difference in the habits of the black and brown rats, and an animosity of the latter to the former.

"The black ones," he says, "do not burrow and run into shores as the others do, but chiefly lie in the ceilings and wainscots in houses, and in outhouses they lie under the ridge tiles, and behind the rafters, and run about the side-plates; but their numbers are greatly diminished to what they were formerly, not many of them being now left, for the Norway rats always drive them out and kill them wherever they can come at them; as a proof of which I was once exercising my employment at a gentleman's house, and when the night came that I appointed to catch, I set all my traps going as usual, and in the lower part of the house in the cellars I caught the Norway rats, but in the upper part of the house I took nothing but black rats. I then put them together into a great cage to keep them alive till the morning, that the gentleman might see them, when the Norway rats killed the black rats immediately, and devoured them in my presence."

But although the gradual extermination of the black rat has been attributed to the antagonism of the two species, and to the superior strength of the brown rat, several instances have been noted in which the two species have been found living together within a very circumscribed area, as, for example, on board the same ship.[1]

The account given of the black rat in Bell's "British Quadrupeds" is not satisfactory, the information as to its present distribution in this country being very meagre, and little or nothing being said as to its geographical range beyond the British Isles. The present writer has endeavoured to supply this deficiency in the essay referred to.

As to the existence of a third form of rat in the British Islands, the so-called *Mus hibernicus*, the reader may be referred to the *Zoologist*, 1889, p. 321 (where a figure is given), 1890, p. 135, and 1891, pp. 1–9.

On most farms at the present time there are more rats than poultry, and the rats begin to increase earlier than do the ducks or fowls. They should therefore be dealt with accordingly. An open winter causes the fields to be more than usually full of rats. After vegetation has commenced and when birds have begun to lay, it is difficult to hunt the hedgerows properly. The banks and holes should be ferreted in good time. When cats, weasels, and stoats were more numerous, and hawks and owls were less molested, rats and mice had these natural enemies to reduce their numbers, but now it is otherwise; and with corn stacked about the land, and with sheep troughfed with corn and cake in all directions, rats find plenty to eat, and increase in proportion.

Concerted action on the part of farmers whose lands adjoin might be easily arranged, and would be generally beneficial. If one man sets to work with his ferrets, poison, or traps to reduce the stock of rats on his farm, the likeliest holes and banks are quickly re-tenanted by the excess of rats upon some neighbouring farm, where the younger are persecuted by the older. Rats emigrate from one farm to another, as convenience suggests. If only one occupier, here and there, goes to work to have a day's slaughter among the vermin, the stock of rats in the country rapidly readjusts itself to new conditions, just as water finds its level; and, before the time for breeding begins, the surplus breeders of one place will take possession of any vacant quarters which may be found on another.

As regards rats and mice, then, we would advise (1) in the

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[1] Harting, *Essays on Sport and Natural History*, 1883, pp. 164, 165.

farm buildings, outhouses, and stackyards, trap by some of the means above suggested, (2) in the hedgerows and banks, ferret at the proper season by concerted action, and (3) suffer at least the white and brown owls, the kestrel, and the weasel to live, and follow their natural inclinations by preying upon these enemies to the agriculturist.

The common house-mouse (*Mus musculus*) is too well known to require particular description, and the remarks made as to the destructiveness of rats in farm buildings and stack-yards apply almost as forcibly to this little pest. Being very prolific, when they have once taken possession of a wheat-rick they perforate it with their runs, and destroy great quantities of grain. In such a situation, the best form of trap is an unbaited one, pushed into the larger runs; either a light gin, or a small box-trap open at both ends so that the mice, seeing daylight at the opposite end from which they enter, will run through and get caught. There is this drawback, however, that in each trap only one mouse is caught at a time, and what is that among so many? Unless a great number of traps are set, and repeatedly inspected, there will be but little visible diminution in the number of mice.

The common figure of 4 trap is one of the best for setting in the open air, and should be baited with a soaked bean, or, by way of a change with hard toasted cheese, or a bit of fat. For buildings, the best form of mouse-trap is Pullinger's patent; it requires no setting and not often baiting; it is not liable to get out of order, and with care will last for many years. In this trap two mice may be caught at a time, and no matter how many are caught, if the trap be cleaned from time to time, and a little fresh grease placed in the part of the trap they first enter, they never seem to get shy or afraid of entering it. It generally happens with the majority of mouse traps that when two or three mice have been caught, the others suspect something wrong, and will not go near it.

Another plan is to keep a good cat or two about the farm buildings and rickyards, although in game-preserving districts this is not always easy, as they will wander away in search of young rabbits, and such young game-birds as they can surprise.

A more efficacious plan is to encourage weasels about the stackyards. Their small size, long slender bodies, and short legs enable them to follow the mice into the stacks, and through all their runs. Mice of all kinds are their natural prey; they hunt them with avidity, and a pair of weasels, if allowed to rear a little family of their own, would, in the course of a few months,

destroy a much larger number of mice than could be captured one at a time in any form of trap yet invented. Any one who has stood by to watch the result when a wheat-rick is being "ferreted" cannot have failed to observe what consternation is caused amongst the rats and mice as soon as the ferret has traversed some of the "runs." They show themselves then in all directions, and many a one falls a victim to an eager terrier, or to a well-aimed blow from a bystander, which, but for the interference of the ferret, would never have been seen. The weasel is to the mouse what the ferret is to the rat—an inveterate foe, and its presence in a stackyard ought to be welcomed, instead of being looked upon with a suspicion which too often results in its untimely death.

The common house mouse, though doubtless the best known and most numerous of its family, is not the only species of the genus *Mus* which infests the farm, garden, and young plantations, and does more or less injury of one kind or another to the agriculturist. There are the harvest mouse, *Mus messorius*, the tiniest of British quadrupeds, with the exception of the lesser shrew (*Sorex minutus*, Linn.); the long-tailed field mouse, *Mus sylvaticus*; and the field voles, *Arvicola agrestis*, and *A. glareolus*.

The last named are often called field-mice, and the peculiarities of structure and mode of life which distinguish them from the true mice are not generally recognised except by professed naturalists. In order to show clearly what these differences are, we give figures of a typical mouse, the long-tailed field-mouse (p. 218), and the short-tailed vole (p. 222). On comparison, it will be seen that the mouse has a pointed muzzle, large prominent ears, and a long naked tail, while the vole has a blunt rounded muzzle, short ears almost hidden in the fur, and a short hairy tail. A more minute inspection will show that the dentition also is different. As regards colour, the long-tailed field mouse is a reddish brown or sandy colour above, and white beneath, the line of demarcation between these two colours being very noticeable. The short-tailed vole is grey-brown above and pale grey beneath, the two shades of colour merging so gradually as to cause the animal at a little distance to appear almost uniform in colour. The habits of mice and voles are quite different; the former frequenting houses, farm buildings, stables, granaries, and ricks, the latter living in the open fields, where they burrow and form runs in all directions.

The long-tailed field-mouse, although found dwelling in stacks in smaller numbers than the house mouse, is more often to be met with in kitchen-gardens, nursery-grounds, hedge-

banks, and corn-fields, where, being very prolific, and laying up winter stores, it does an immense amount of mischief to grain and seeds of all kinds, peas, beans, and fruit, to say nothing of nuts and acorns, to which it is more welcome. Its retreat is formed underground, though not invariably so, and an observer in Lancashire states that the nests of the field mice are often a source of great annoyance in the hayfields, for they get into the knives of the mowing machines and choke them, involving a stoppage to clear them out, and leaving unsightly ridges of grass where they have been dragged along.

But the retreat is not always underground. It often makes

FIG. 1.—The Long-tailed Field-mouse *Mus sylvaticus.*

a regular nest in a hedgebank, and we have seen one which was taken out of the foundation of a rook's nest in an elm tree, at a considerable elevation from the ground; another in an old nest of the mistletoe thrush, twelve feet up in an oak, and roofed over with grass and leaves; a third in the deserted nest of a blackbird.

The quantity of food which is hoarded up for winter use is sometimes astonishing; corn, beans, peas, acorns, nuts, and seeds of various kinds may be found in handfuls in these winter retreats, and (as long ago remarked by Pennant) much damage is done to the fields where pigs are turned out by reason of their rooting up the ground in search of these concealed hoards

of the field-mice. Rooks and crows also do good service in digging out, killing, and eating young field-mice, and we have taken these little quadrupeds whole, though partially digested, from the stomachs of the stone curlew (*Œdicnemus*) and the viper. Foxes are very fond of field-mice, and can catch them as well as a cat can. When a vixen fox has young, she will go mouse-hunting, and will bring home several at a time, *i.e.* five or six in her mouth at once.

Some notion of the rapidity with which these destructive but beautiful little animals increase may be gathered from the observations of Mr. R. M. Barrington, who kept several long-tailed field-mice in captivity, and took note of the dates when young were produced as well as the number of each litter.[1]

The period of gestation is three weeks.

Three young ones were born on the 7th or 8th of March, when the mother was about five months and a half old. Observation was kept upon two females, marked respectively A and B to distinguish them, with the following result:—

				Interval since last litter
March	7 or 8	A	3 young	——
„	19	B	5 „	——
„	31	A	3 „	24 days
April	18	B	5 „	29 „
„	24	A	3 „	24 „
May	11	B	5 „	23 „
„	17	A	4 „	23 „
June	12	A (?)	4 „	26 „
July	9	A (?)	4 „	27 „

This table shows the number of young which two long-tailed field-mice are capable of producing in less than five months, and had not one of them contrived to escape early in June, the number of young would have been still larger.

"During April [says Mr. Barrington (l.c.)] we had twelve to twenty mice, young and old, in the nest; they all slept together, and it was certainly a curious sight to see fathers, mothers, and children of all ages and sizes in the nest, the young of different ages suckling the same mother at the same time, and the mothers appearing to suckle each others' young indiscriminately."

The young were carried about by the parent in the mouth as cats carry their kittens.

In gardens where these mice abound, and where if unchecked they will do great damage to early planted peas and seeds, cats should be encouraged, and traps set in good time. One of the most effective traps is made as follows:—

[1] *Zoologist*, April 1881, pp. 121–123.

"Two pegs are thrust firmly into the ground, standing a few inches high at such a distance apart as to admit of a brick being placed between them. A piece of twine is then taken, and a bean which has been softened by soaking is threaded upon it like a bead. It is then extended between the two pegs, and firmly secured at either end to them, the bean being about the middle of the twine. The brick is then placed between the pegs in such a position that one end is supported by the twine, whilst the other remains upon the ground. The mice in eating the bean, which they will not fail to do, sever the string and the brick falls upon them."

Tiles, or heavy slates, may be substituted for bricks, but, in that case, one should be placed on the ground to form a floor, otherwise the weight of the falling one might not be sufficient to kill a mouse if only loose soil were beneath. With this form of trap a dozen mice have been taken in one garden in a single night.

But, as in the case of many other so-called "vermin," their presence is not always an unmixed evil, and the long-tailed field-mouse makes some little amends for its depredations in our gardens and fields by devouring various kinds of aphides, and the larvæ of moths and beetles which are destructive to crops.

The late Mr. Edwin Birchall, a good entomologist, has described (*Zoologist*, 1866, pp. 8–9) the number and variety of moths eaten by the long-tailed field-mouse, the rejected wings in each case indicating the species whose body had been devoured by the mouse which he trapped.

He made a careful examination of these and found among them the remains of the following twenty species:—

Xylophasia polyodon (a few), *Charæas graminis* (a few), *Luperina testacea* (a few), *Agrotis suffusa* and *Agrotis segetum* (abundantly), *Triphæna orbona* (abundantly), *Noctua glareosa* (abundantly), *N. festiva* and *N. xanthographa* (a few), *Orthosia macilenta* (in profusion), *Anchocelis rufina*, and *A. litura* (several), *Cerastis vaccinii* (abundantly), *Xanthia ferruginea* (abundantly), *Miselia oxycanthæ* (one only), *Agriopis aprilina* (abundantly), *Phlogophora meticulosa* (a few), *Hadena glauca* (one only), *Plusia gamma* (in hundreds), and *Amphipyra tragopogonis* (one only).

The little harvest-mouse (*Mus messorius*) already alluded to, and here figured (Fig. 2) is, like the last named, a dweller in stacks as well as in the open country. It forms a winter retreat underground, and a summer dwelling amid the corn-stalks in the shape of a globular nest composed of grasses or split leaves of the reed, and suspended among the living plants at a little distance from the ground. Its prehensile tail is a noteworthy feature, and it is of great service to the little animal when de scending the wheat-stalks.

Like the last named species, it is to a certain extent insecti-

vorous,[1] and for this reason, as well as on account of its small size and comparatively local distribution, it cannot be regarded as particularly harmful to the agriculturist.

We have several times kept harvest-mice in captivity and got them to rear their young to maturity, and very pretty little pets they become, allowing themselves to be handled without attempting to bite, and taking food from the hand.[2]

The accurate account of this little animal given by Gilbert White in his thirteenth letter to Pennant should be read by

FIG. 2.—The Harvest-mouse, *Mus messorius*.

everyone who desires to know something of its habits. He measured one and found that from nose to tail it was just 2¼ inches, with a tail 2 inches long. Two of them in a scale weighed down just one copper halfpenny, which is about the third of an ounce avoirdupois, or one-sixth the weight of an adult common house-mouse.

We are indebted to Gilbert White for the first published account of this beautiful little animal as indigenous to this country, although it appears to have been previously seen by Montagu in Wiltshire (cf. "Trans. Linn. Soc." vol. vii. p. 274). White communicated his discovery to Pennant, who published it

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[1] Bingley, *Animal Biography*, and Bartlett, *Zoologist*, Vol. i. p. 289.
[2] Harting, *The Field*, January 2, 1875.

in the second edition of his "British Quadrupeds," and thence it has been copied, with but little addition, by almost every writer on the subject of British Mammalia.

The characteristic features which serve to distinguish the voles (*Arvicolidæ*) from the true mice (*Muridæ*) have already been pointed out (page 217.) In the British Islands we have three species of the former, namely the short-tailed vole (*Arvicola agrestis*), (Fig. 3); the bank vole (*Arvicola glareolus*), a somewhat smaller animal, redder in colour, with larger and more upright ears, narrower and less flattened head, larger eyes, and longer tail;

Fig. 3.—The Short-tailed Vole, *Arvicola agrestis.*

and the well-known water vole (*Arvicola amphibius*), commonly called the water rat.

All three are herbivorous, and the first named is particularly destructive on pasture lands, where, if not kept in check, it will increase enormously and rapidly, to the serious prejudice of the sheep and consequent loss to the farmer. It is usually, but not exclusively, found in damp situations, whence its local names of "meadow mouse" and "water mouse." It forms burrows of considerable extent, as well as more superficial runs amongst the roots of the grass and herbage, and it may be seen abroad at all seasons of the year, and at all hours of the day, though it is most active towards nightfall.

In connection with this little rodent, nothing is more re-

markable than the way in which it periodically swarms, overrunning particular districts, and completely devastating the pastures. Many such "plagues of mice" are on record. Childrey in his "Britannia Baconica," 1660, relates (p. 14) that in 1580 an extraordinary swarm of field-mice appeared in Denge Hundred, Essex, and ate up all the roots of the grass.

"A great number of owles," he says, "of strange and various colours [probably the short-eared owl] assembled and devoured them all, and after they had made an end of their prey, they took flight back again from whence they came."

In the years 1813–14, another such plague of mice occurred in Gloucestershire and Hampshire. Particulars of this visitation will be found in an essay, entitled "An account of the unexampled devastations committed by Field-mice in the Forest of Dean in Gloucestershire, and in the New Forest in Hampshire during the years 1813 and 1814. In a letter to the late Right Hon. Sir Joseph Banks, Bart., P.R.S., from the late Right Hon. Sylvester Douglas, Lord Glenbervie."

From this account, which is dated June 30, 1814, and is printed in the first volume of *The Zoological Journal* (1825), pp. 433–444, it appears that more than 30,000 field-mice were caught in the Forest of Dean by various methods, and 11,500 in the New Forest. The species caught were both the long-tailed *Mus sylvaticus* and the short-tailed *Arvicola agrestis*, the latter most numerous, being in the proportion of fifty to one.[1]

The methods employed were (1) the turning out of a number of cats; (2) clearing the ground, so as to expose the mice more effectually to their natural enemies; (3) poisoned meal made up into paste balls and scattered about; (4) traps of seven or eight patterns; and (5) pitfalls, wider at the bottom than at the top.

In 1874–5 a similar plague, though less serious and extensive, occurred in Wensleydale, where a single farmer reported that "in a field of about sixty acres in extent, there were, without exaggeration, thousands of mice, which did much damage to the grass."[2]

This visitation seems to have lasted for at least two years, for in 1878, at the meeting of the British Association, Sir Walter Elliott reported that in the spring of 1876 the short-tailed vole appeared in such numbers in the hill pasture farms of the border districts between England and Scotland, and parts of Yorkshire and Wensleydale, as to destroy the grazing-ground

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[1] Besides the account above referred to, see also that given by Jesse in his *Gleanings in Natural History* (1st Series), pp. 175–184, and St. John, *Natural History of the Highlands*, p. 67.

[2] See *The Field*, June 24, 1874.

on which the sheep depended in spring, causing serious loss to the farmers by impoverishment and death of stock.[1]

Now again in the present year (1892), we hear of an alarming increase of these little pests in the South of Scotland, where it is reported that this plague is especially serious along the northern boundary of Dumfriesshire, east of Thornhill, and in the north-west of Roxburgh, while the border districts in the south of Selkirk, Peebles, and Lanark, and the parishes of Carsphairn and Dalry in the extreme north of the Stewartry of Kirkcudbright, are also reported to be more or less affected. In Roxburgh and Dumfries, the plague is estimated to have extended over an area of from 80,000 to 90,000 acres.[2]

A preponderance of opinion amongst farmers is reported, tracing the cause of the present outbreak to the scarcity of owls, kestrels, weasels, and other so-called vermin. All these animals are to be ranged among the natural enemies of the mice, and even crows may be placed in the same category.

History sometimes curiously repeats itself, and it may be here noted that the statement made by Childrey as to the assemblage of owls when the field-mice swarmed in Essex in 1580, has received confirmation during the present year in the South of Scotland. Local observers report that since the great increase of voles was noticed there, the short-eared owl (*Otus brachyotus*) has become much more numerous on the hill-farms, and that many pairs have, contrary to precedent, remained to breed.

A climatic cause of very considerable importance is also pointed out in the fact that the peculiarly luxuriant hill growth in the winter of 1890–91, coupled with the mildness of that season, in Scotland, afforded the voles unusual advantages in the shape of food and shelter from their natural enemies, and favoured their increase (Report, l.c.).

In view of the fact that a Departmental Committee of the Board of Agriculture has been appointed to inquire into the cause and origin of the plague, and to consider the best means of preventing further mischief and consequent loss to agriculturists in the districts affected, it will be well to suspend judgment until the report of the Committee has appeared.

Damage to young trees in enclosed plantations has also been observed, but this, as suggested by Major Craigie, may, perhaps,

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[1] See *British Association Reports* 1878, and *Nature*, August 29, 1878, p. 483. See also Elliott, *Proc. Berwick Nat. Club.*, vol. viii. p. 447.

[2] *Reports to the Board of Agriculture on the Plague of Field Mice or Voles in the South of Scotland*, 1892.

be attributed to another species, namely, the bank vole (*Arvicola glareolus*), already mentioned.[1]

Besides these two little animals, both so destructive in their habits, we have still to notice the larger water vole or "water rat" (*Arvicola amphibius*). Although commonly to be met with along the banks of rivers, streams, and mill-dams, where it sometimes does much mischief by perforating the banks and letting down the water, it burrows also in meadows sometimes at a distance from water, and in ploughed fields. In one of his delightful letters to Pennant,[2] Gilbert White relates that—

> "As a neighbour was lately ploughing in a dry chalky field far removed from any water, he turned out a water-rat, that was curiously laid up in an hybernaculum artificially formed of grass and leaves. At one end of the burrow lay above a gallon of potatoes regularly stowed, on which it was to have supported itself for the winter."

In hard weather, when the streams are frozen up, it will attack not only potatoes, but turnips, carrots, and mangel, as well as the bark of trees, such as willows and osiers. In the summer months it shows a preference for the inner or concealed parts of some species of sword-flags, which are very succulent and sweet-tasted. As this portion is usually under water, the animal gnaws the plant in two, near the root, when it rises to the surface, and being conveyed to some sound footing is consumed at leisure.[3] It treats in the same way the large horse-tail (*Equisetum*), preferring the white succulent portion of the stem near the root. In default of this more favourite food, it will eat the common duck-weed, rejecting only the roots and other fibrous parts of the plant.

There is no truth in the statement that the water vole is carnivorous; at least, in the course of twenty years' observation of its habits, we have never met with any proof of the assertion, and it is probable that the idea has arisen from confounding this animal with the common barn rat, which, as already noticed, takes to the country in summer, and haunts the banks of streams wherever there is shelter enough to favour its concealment.

We have repeatedly shot water voles for the sake of their skins, and on examining the contents of the stomachs, found nothing but a mass of vegetable matter.

For this reason, amongst others, the water vole may be regarded as comparatively harmless. Its chief fault is the

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[1] Of this species a long and tolerably complete account, with a figure, will be found in the *Zoologist*, 1887, pp. 361–371.

[2] Letter XXVI. to Thomas Pennant.

[3] Bell, *British Quadrupeds*, 2nd ed., 1874, p. 319.

damage it does to osier-beds when other food fails, and on this account, looking to the value of osiers, proprietors cannot be blamed for taking the most effective measures to keep these little animals in check.

To many people, mice and shrews appear very much alike, and are supposed to be nearly related. The latter are often called shrew-mice, and are blamed for a good deal of mischief they never do, and for living on food they never touch.

As a matter of fact, the shrews are not only not members of the same "family," but they do not belong even to the same "order." The mice and voles belong to the order Rodentia, or gnawing animals; the shrews to the Insectivora. The former are graminivorous and herbivorous; the latter live upon worms, flies, spiders, moths, beetles, and the larvæ of the two last named, and the dentition of each is modified in accordance with its habits and mode of life. Thus if we examine the skull of a vole, it will be seen that there are no canine teeth; only long chisel-like incisors for cutting and peeling, and molars for grinding and reducing the food to pulp. Shrews, however, resemble in their dentition the strictly insectivorous bats, the molars or grinding teeth being similarly furnished with several sharp cusps or points, which are characteristic of insect-eating mammals, and all the teeth have roots or fangs. There are other peculiarities of structure, to which, however, at present, there is no need to refer.

From its shy and retired habits, the common shrew (*Sorex araneus*) (Fig. 4), is not often to be observed in a living state, but may be frequently seen lying dead on the pathway. The cause of the mortality among these little animals, though often noticed, has never been satisfactorily accounted for. It has been said that their odour is repulsive to their enemies, who will kill but will not eat them. But this is not invariably the case, for we have found numerous skulls of shrews in the rejected "pellets" or "castings" of the barn owl, and once took two of these little creatures from the stomach of a stone curlew (*Œdicnemus*).

In Shropshire and Staffordshire it is called "nursrow," a corruption of "nose-shrew," A.-S. *nase screawa*, from its prominent feature. In Wiltshire it is known as "over-runner," and elsewhere "ranny-mouse," names no doubt bestowed by believers in the popular fallacy that a shrew is "very mischievous to cattle, which going over a beast's back will make it lame in the chine."[1] Readers of White's "Selborne" will

[1] Phillips, *New World of Words*, 1658.

remember the description of the "shrew-ash," whose twigs or branches when applied to the limbs of cattle were supposed to immediately relieve the pains which the beast suffers from the running of a shrew over the part affected.[1] It seems almost needless at the present day to remark that the common shrew is perfectly harmless, and living as it does chiefly upon worms and insect larvæ, and sometimes (according to Jesse) upon young frogs, its name should for ever be removed from the list of so-called "vermin."

An excellent field naturalist, the late Charles St. John, has stated in his "Natural History of the Highlands," that the

Fig. 4.—The Common Shrew, *Sorex araneus*.

shrew-mouse has a propensity for barking trees, but we have never been able to confirm this observation.

The water shrew (*Crassopus fodiens*) a larger species, measuring about five inches in length instead of four, is by nature, as its name implies, of more aquatic habits, and is usually found in the vicinity of some pool or rivulet in the bank of which it forms a long and winding burrow terminating in a small chamber lined with dry grass, in which the young, six to ten in number, are deposited about the beginning of May. In addition to the food taken by its smaller relative, the water shrew preys on fresh-water mollusca, minute crustacea, and small fish, which it pursues (as remarked by an eye-witness)

[1] *Natural History of Selborne.* Letter XXVIII. to Daines Barrington.

with all the grace and agility of an otter. It feeds also on the larvæ of caddis flies (*Zoologist*, 1874, p. 3829). Like the last named species, it is perfectly harmless.

Before taking leave altogether of the mice, we may notice a little animal which both in name and general appearance reminds one of a mouse, namely the dormouse (*Myoxus avellanarius*) (Fig. 5). More robust in form than a common mouse, with denser fur of a reddish sandy hue, short rounded ears, bushy tail, and feet well formed for grasping, it spends its time chiefly in the woods and plantations, where it forms a nest amongst the underwood, or on the ground (*Zoologist*, 1872, p. 2908), or even takes possession of the deserted nest of a blackbird or thrush.

FIG. 5.—The Dormouse *Myoxus avellanarius.*

The specific name *avellanarius* originated from the idea that the dormouse feeds chiefly on hazel-nuts, and, indeed, it is most often to be met with in woods which consist of oak and hazel underwood growing from old stumps, in which these mice make their winter quarters. In October, 1887, a man at Aylesbury had no less than five dozen dormice which were caught in the nut-rows on Buckland Common, on the borders of Bucks and Herts.

In addition to hazel-nuts, its food consists of fallen acorns,

seeds of the hornbeam and other forest trees, grain, and fruit of different kinds, particularly grapes. In confinement, a bit of apple or pear, if offered, is generally eaten with relish. The dormouse will also suck the eggs of small birds, as a squirrel will do, and it seems to be not generally known that it is insectivorous. A tame dormouse, when allowed a run in the garden, would eat the Woolly Aphis, *Aphis lanigera*, and the caterpillars of the Eyed Hawk-moth, *Smerinthus ocellatus*. It was very fond, too, of the grubs of the Nut Weevil, *Balaninus nucum*, preferring on that account maggoty nuts to sound ones. It would also eat the small caterpillars found in apples and pears. Having regard, then, to the nature of its food, it cannot be said to be very destructive to agriculture, nor deserve to be reckoned amongst the vermin of the farm. It holds, as it were, an intermediate position between the mouse and the squirrel,[1] and its actions and habits remind us more of the latter than of the former. It climbs much, sits up like a squirrel on its haunches, holds its food in its forepaws, and has a bushy tail. It lays up a winter store, and hybernates, sleeping sometimes as long as six months uninterruptedly. In the *Zoologist* for May, 1882, will be found a very interesting article on the hybernation of the dormouse, in which the writer, Herr A. Rabus, gives the results of experiments made by him in regard to temperature, loss of weight, duration of sleep, and number of respirations to the minute.

Much as one would like to say a good word for so pretty and graceful an animal as the squirrel (*Sciurus vulgaris*), frequent observation of its habits and the nature of its food compels us to admit that in some respects it is very destructive. Its bill of fare is remarkably varied. It lives upon acorns, beech mast, hazel-nuts, filberts, the bark of young trees, especially birch and sycamore, leaf-buds and tender shoots, the cones of larch and other pines, also bilberries (*Zoologist*, 1864, p. 9359). Though living chiefly amongst trees, in the holes of which it retires and lays up its winter stores, it frequently descends to the ground in search of fallen nuts and beech mast, and digs up and eats truffles, for which it will hunt by scent.[2] In Sep-

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[1] A mouse has three molar teeth in each jaw, a squirrel five, and a dormouse four, but in their structure those of the dormouse differ from both the others. This and other peculiarities, notably the absence of a cæcum (or "blind gut"), has induced zoologists to place animals of the dormouse kind in a separate family, *Myoxidæ*, between the *Muridæ* and *Sciuridæ*.

[2] Blasius, *Säugethiere Deutschlands;* von Tschudi, *Thierleben der Alpenwelt;* Alston, *Zoologist*, 1865, p. 9483; Newton, *Zoologist*, 1865, pp. 9560 and 9648.

tember, 1888, we watched a squirrel for some time breaking up and eating a large white fungus (*Boletus edulis*) growing under a tree on the lawn at Nynehead Court, near Wellington, Somerset, where squirrels are fairly common. We have observed a similar thing also in West Sussex amongst the fine beech trees at Uppark. So long as attention is confined to fungi, no one will be disposed to complain, nor can the squirrel be blamed for attacking galls. If a squirrel comes across an oak tree bearing galls, it will break open a number, one after another, apparently in expectation of finding a kernel inside, or perhaps the larva of some gall-producing insect. Squirrels have been observed thus to attack galls in Ireland.[1]

But the chief damage done by squirrels is the injury caused to the top shoots of coniferous trees. In plantations of Scotch fir, larch, and occasionally spruce, they attack the trees in spring, between April and June, when the sap is in full flow, biting off the outer bark and consuming the inner. This stops the flow of sap, which then becomes dry and resinous, and the first high wind blows the top off.

One of the wood-wards in the Forest of Dean noticed in the larch plantations both branches and tops broken off by the wind, several acres being strewn with the *débris*, and after some time discovered that this was due to the attacks of squirrels. Their mode of procedure was by peeling off the bark, not only in isolated patches, but in broad rings all round the branch or bole of the tree, thus killing so much of the branch as was above, which after a time decaying, gave way before the wind.

Mr. A. D. Webster, of Llandegai, whilst walking through an old plantation, noticed two squirrels busily engaged in depriving a cluster pine of its cones. As the cones were quite green and hard, he was anxious to discover the reason for taking them. This soon became apparent, for lying at the foot of the tree were several cones gnawed to the heart, and all the seeds extracted. Some of the cones which were too heavy to carry were dropped to the ground to be attacked at leisure.

"Here," adds Mr. Webster, "the squirrels are very destructive to the young buds of the horse chestnut. Lime-trees, also, suffer by having the bark stripped from their branches, evidently as material for nest-making, and the holly occasionally is treated in a similar manner."

During hard weather, squirrels have been observed to descend to the poultry yards and steal food from the troughs.

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[1] *Field*, October 7, 1871.

Nor does their taste for variety end here. They may be said to be really omnivorous; for, besides the vegetable food already mentioned, they will devour, when opportunity serves them, both eggs and young birds. The eggs chiefly taken are those of such birds as nest in the holes of trees (as starlings, jackdaws, and stockdoves), for the reason that they are more easily reached. Smaller eggs placed in delicate nests at the extremities of boughs are comparatively safe, for the weight and motion of an approaching squirrel would prevent the animal from reaching them properly, or would jerk the eggs out of the nest. As to young birds being preyed on by squirrels, there is ample evidence. Two instances may be cited:—

In May, 1879, Mr. Thomas Bagnall, of Milton Ernest Hall, Bedford, saw a squirrel in his avenue carry off, kill, and partially eat a full-fledged young starling, the remains of which he succeeded in recovering.

In August, 1891, Mr. T. W. Pinder, of Barrowby Old Hall, Grantham, saw a squirrel in a thorn-tree in which were a number of sparrows. It made a dash and caught one, the others screaming and fluttering away in great excitement. It held the bird in its forepaws, and killed it by biting the skull, and then commenced to eat it.

Thus the carnivorous propensities of the squirrel, if not habitual, are at least shown to have been exhibited on various occasions, and are probably indulged in more frequently than they are observed.

As to the strictly carnivorous vermin of the farm, such as stoats and polecats, and the so-called "winged vermin," some account of them may be reserved for a future occasion.

J. E. Harting.

EDITORIAL NOTE.

The plague of field mice (voles) has excited so much public interest that it seems desirable to add a note of all that, up to the time of going to press, can be gleaned upon the subject.

The field-vole is found in most parts of Europe and in many parts of Asia. More than a century ago a statement was published[1] to the effect that at Volhynia, Poland, "mice have destroyed the new-sown grain in such a manner as to leave no hope of a future crop; the mice have been carried into the

[1] *Gentleman's Magazine*, 1774, vol. 44, p. 540.

barns and are making terrible havoc amongst the unthreshed corn." There are also records of extensive mischief perpetrated by these small mammals in Germany and Italy. In the latter country they undermined embankments, gnawed off the shoots of vines, and did permanent injury in gardens.

For purposes of suppression similar methods to those that have been employed in the Forest of Dean and the New Forest in this country have been resorted to in Continental districts. Thus, in this Journal (Vol. X., S.S., 1874, p. 317), Professor Wrightson states:—

> "Throughout Germany, Austria, and Hungary the agriculturist is plagued by the depredations of field-mice. These creatures multiply with great rapidity, and in dry seasons literally swarm over the country, destroying the crops over vast areas of land. No one seems able to suggest a cure, for the mice are about as difficult to reduce to reasonable limits as any of those insect plagues which from time to time attack our cornfields. I first noticed the depredations of mice at Talos, on Count Esterhazy's estate, whence both wheat and lucerne were injured by them. The ground truly seemed alive with them, and they might be seen darting to and fro by anyone who would walk a few steps into the standing corn. The country from Kanisa to Fünfkirchen and Villány was almost devastated from this cause, the wheat crops being beaten down, and often reduced to a few scattered straws standing up amid the wreck of a fine wheat crop. M. Elvers cut trenches 10 inches deep and 7 inches to 8 inches wide entirely around his cornfields to, if possible, keep out the mice. At intervals pots were sunk, so as to form a succession of pitfalls at the bottom of this trench and were filled with water. The mice, on falling into this trench, ran along the bottom and fell into these traps in large numbers."

The ravages of voles in the Border Counties of Scotland are attended with consequences of the most serious character to the hill sheep farmers. The herbage of these northern hills is, at best, only of poor quality, but it is the most nutritious that the mountain slopes can produce, and, though it would be despised by a lowland farmer, its value in the restricted localities in which it grows has been demonstrated over and over again. Heather, ling, moss, deer's hair, and spret are amongst the plants which thus serve as forage in these remote districts. Heather, or he-heather, is *Calluna vulgaris*, Salisb., known to botanists as ling, and hill sheep eat its young shoots readily. They do not, however, care for the she-heather, *Erica cinerea*, L., and the bell-heather, *Erica Tetralix*, L. Ling is, strangely enough, the name given to the hare's-tail cotton grass, *Eriophorum vaginatum*, L., a member of the sedge family. It is one of the earliest and best relished plants of the hills, being eaten by the sheep with great avidity, especially the roots; the first shoots and the flower stalks are generally known as moss. Deer's-hair is a species of club-rush, *Scirpus*. Stool-bent, or

rose-bent, is the heath rush, *Juncus squarrosus*, L.; it is common on all the Border moors, and affords a good early bite to sheep in spring. Broad-bent, or flying-bent, is the name of the blue moor grass, *Molinia cœrulea*, Mœnch., which is eaten by sheep in the early months of the year, whilst if cut soon enough it makes excellent bog-hay. Wire-bent or black-bent is the English mat grass, *Nardus stricta*, L., which is palatable to sheep when it first sprouts. Bull's-faces, bull-snout, or starr grass, is the harsh tussock grass or tufted hair grass, *Aira cæspitosa*, L., and is much valued upon the hills, as it stands the winter frost well. The well-known Yorkshire fog, *Holcus lanatus*, L., is also called midge grass and forms the bulk of the bottom or benty bog. Spret and spretty grasses are various kinds of succulent rushes, especially *Juncus articulatus* and *Juncus lamprocarpus*, Ehr., which are abundant constituents of bog-hay. The carnation grass, *Carex panicea*, L. (the pink-leaved sedge), as well as Yorkshire fog, is known as pry or prye grass. It will be noticed that, of the species named, most are such as would not be tolerated in ordinary English pastures, whilst tussock grass and Yorkshire fog, when they do so occur, are viewed with disfavour, and are got rid of if possible. Nevertheless, it is on the plants that have been enumerated that the hill sheep thrive, and it is the scanty subsistence thus afforded which in early spring is threatened by the hordes of voles.

We are indebted for much of our information to a valuable report,[1] published nearly twenty years ago, wherein it is stated that the hardy flocks of Cheviot and other sheep bred on the higher Border hills retain much of their wild nature, and depend almost wholly on natural instinct in seeking their daily food. The flock or "hirsel" on a large farm forms itself into three, four, or more divisions, called "cuts," each keeping to its own range of pasture, and feeding gradually upwards to its resting place for the night near the top. If disturbed in any way one of the sheep gives the alarm by stamping with its foot and uttering a sort of hiss, whereupon the whole "cut" runs away up-hill. As winter approaches the sheep are compelled to browse upon the spret grasses in the lower lands, whence a crop of bog hay has been gathered in the previous summer. Here fresh and verdant spots still remain till they become obliterated by frost and snow. At this period the sheep are reduced to great straits, and fall off in condition. Nevertheless they struggle on and eat up every bit of green vegetation they can find. "I have often," says the Ettrick Shepherd, "stopped in

[1] Elliot, *Proc. Berwickshire Nat. Club.*, 1873–74.

the middle of a flock in fields half covered with snow, where no grass whatever was to be seen. The sheep, however, having their eyes nearer to the ground, perceived the points of some leaves, and, scratching with their feet to obtain more, seized it with their teeth, even pulling up the roots with their leaves." At this stage the shepherd comes to the aid of the sheep, and doles out the bog hay, and thus enables them to struggle on till the herbage revives with returning spring. The importance of this early herbage to flocks already emaciated by scanty fare, at a time, moreover, when ewes due to lamb require more than usual nourishment, is obvious, and it is this prospective provender which becomes so sorely threatened by the "plague of mice."

The reader is already aware that the depredators are not mice, but field voles (*Arvicola agrestis*). They differ, as Mr. Harting points out, from the true mice (genus *Mus*) in their stouter body, thicker head, obtuse muzzle, small ears, and the tail shorter than the body, from which last-named character they are often called short-tailed mice. By means of their two pairs of adze-like incisors they are able to cut through wood, and to do extensive mischief in fields, woods, and gardens. The vole is prolific, having usually three or four litters in a year, with commonly five or six young at a birth. In abnormal seasons this rate is exceeded, and young voles may be seen as early as February and as late as November. The favourite haunts of voles are low-lying moist grass-lands and damp plantations. They form numerous tortuous burrows near the surface of the ground, and live in communities, though each pair have their own dwelling in which they bring up their young, and store up their hoard of winter food. Their burrows are kept scrupulously clean, all refuse matter being deposited in little heaps outside. The diet of the vole is almost entirely vegetable, and consists of roots, young shoots of grasses, rushes, and sedges, and the tender bark of shrubs. The little creature is particularly fond of the delicate white stems of the hillside herbage, which are so acceptable to mountain sheep in early spring.

The present abundance of the pest recalls the notorious outbreak in the winter of 1875–76, which was made the subject of a communication by Sir Walter Elliot to the Berwickshire Naturalists' Club. The districts specially infested were the hill farms on the borders of Roxburghshire, Selkirkshire, and Dumfriesshire, especially those adjoining the water-parting between Teviotdale, Eskdale, and Liddesdale. More to the west, the higher portions of Upper Nithsdale suffered seriously. In parts of the West Riding of Yorkshire, particularly in Wensleydale and Bedale, the pest was simultaneously troublesome. The

visitation of 1875–76 appears to have attained its maximum intensity in the cluster of farms at the head of Borthwick Water, which falls into the Teviot three miles above Hawick. Here the outbreak formed the subject of an inquiry conducted by the Teviotdale Farmers' Club, and many of the details then recorded are receiving confirmation in connection with the present trouble. The numbers of the voles, which had for several seasons been steadily increasing, were augmented in the mild winter of 1875–76, and in the ensuing spring they made their presence unmistakably felt on the doomed farms. Between February and April they completely destroyed the pasturage of the bogland in Borthwick Water, and were then driven to feeding on the bents.

The means resorted to for their extermination were not very skilful, and the remedy which had been found so serviceable in the New Forest—that of digging holes into which the voles fell and were captured—was not adopted in time. The abundance of prey, however, induced a large increase in the number of hawks, foxes, and weasels; buzzards, which had long been strangers to the district, again came on the scene, whilst the short- and long-eared owls appeared in numbers. By mid-April the voles had so completely devoured the herbage that they began to suffer from starvation, and the occurrence of severe frost, with some snow, about the middle of the month, completed their discomfiture, so that by the end of May they had mostly disappeared.

A careful inspection of the infected region led to the conclusion that fully one-third of the pastures had been destroyed. The true bog-grasses especially, on which the sheep mainly depend in April and May, had been eaten down to the roots. The ground was strewn with dry stalks and blades, mixed with tufts of hair, limbs, and other remains of the marauders. The sheep were in a deplorable state. Many had died, and the emaciated ewes, too weak to make good nurses, suckled their lambs with difficulty. Numbers of the latter consequently perished, and the survivors were poor and weakly. Besides the loss of animals by death, other disastrous results were felt in the impaired condition of the survivors, the diminished sale of lambs, draft ewes, and wool, and the inadequacy of the rising stock to keep up the "hirsel" to its full producing extent. It was reasonably estimated that on the 10,000 acres of the Borthwick Water pasture alone the damage done could not be valued at less than 5,000*l.*

The causes of the outbreak were attributed partly to the succession of mild winters which had immediately preceded that

of 1875–76, and partly to the destruction that had long been meted out to such raptorial birds as the buzzard, the marsh harrier, the hen harrier, the kestrel, and the owl, and to such carnivorous mammals as the badger, the stoat, and the weasel.

In a recently published letter,[1] Dr. W. B. Wall, of Pembroke, expresses the opinion that the voles, "in consequence of the wet season, have been compelled to migrate from their usual haunts, the lowlying moorlands, and seek food at a higher level."

He adds :—

"The chief enemies of the voles are the short-eared owl (*Otus brachyotus*) and the kestrel hawk, which will do more to reduce their ranks than all the traps of the agriculturist and the microbes of the scientists combined. The kestrel hawk is known to all, duly appreciated by a few, but still destroyed by too many. The short-eared owl is one of our most valuable winter visitors, arriving about October, and leaving usually in March. It frequents the open moors, alights and secretes itself on the ground, in preference to trees, and feeds by day as well as in the evening. In the winter of 1887–8 the moors were crowded with these birds, it being no uncommon occurrence to start two or more at the same time from the long grass; the explanation of their numbers no doubt being that the preceding dry summer had been most favourable to the increase of the animal life of the moors, which supplied ample food and inducement for the birds to congregate. Let the agriculturists of the Border counties, and any other parts which may be similarly afflicted, act the sensible part of protecting these invaluable birds, giving any delinquent found shooting them reason to realise and remember his energies are misdirected, and that by so doing he proves himself the worst of enemies to the suffering agriculturists."

The jay and magpie destroy quantities of young field mice, systematically searching for their nests, and turning them out.[2]

Formidable as the field vole may prove itself to the agriculturist, it is not less so to the forester. In 1813 both the New Forest of Hampshire and the Forest of Dean, in Gloucestershire, were the scenes of attack, and vast numbers of five-year-old oaks and chestnuts were eaten through close to the ground. The voles had a special predilection for hollies, and, having barked the stem, they would climb 5 ft. or 6 ft. and strip the branches. The animals were trapped by holes dug in the ground. As relating to this part of the subject Mr. W. H. Tuck sent to *The Times* of May 16, 1892, the following extract from an old book on forest lore describing the plan adopted in the Forest of Dean in 1813 :—

Holes about 2 ft. long and 10 in. broad at the top, and somewhat larger every way at the bottom, were made at 20 yards apart, over about 3,200 acres of plantation. Persons went round early in the morning to destroy such mice as might be found in the holes. In this way . . . 30,000

[1] *Morning Post*, Jan. 26, 1892.
[2] Appendix, *House of Commons Wild Birds Committee Report*, 1873.

mice were paid for by Government; nor were they extirpated till they had destroyed 1,700 acres, the astonishing number of 200,000 five-year-old oaks, together with an immense number of young seedlings.

In *Stowe's Chronicle* it is stated that—

"About Hallontide last past (1581) in the marshes of Danesey Hundred, in a place called South Minster, in the county of Essex, there sodainlie appeared an infinite number of mice, which overwhelming the whole earth in the said marshes, did sheare and gnaw the grass by the rootes, spoyling and tainting the same with their venimous teeth in such sort, that the cattell which grazed thereon were smitten with a murraine and died thereof; which vermine by policie of man could not be destroyed, till at the last it came to pass that there flocked together such a number of owles, as all the shire was able to yield, whereby the marsh-holders were shortly delivered from the vexation of the said mice. The like of this was also in Kent."

Similar "sore plagues of strange mice" were experienced in Essex again in 1648, and near Downham Market, Norfolk, in 1745. With regard to the last-named place, the following extract[1] is of interest:—

"Once in about six or seven years Helgay, about 1,000 acres, is infested with an incredible number of field mice which, like locusts, would devour the corn of every kind. Invariably there follows a prodigious flight of Norway owls, and they tarry until the mice are entirely destroyed by them.

"C. D.

"Market Downham, *May*, 1754."

In addition to the methods, natural or artificial, of suppressing voles that have been described, reference may be made to the report that Professor Löffler has recently been successful in combating a plague of field mice in Thessaly by means of a contagious virus. Details as to this raid upon the voles in the fields of Greece are not yet available, save that it is stated that bread crumbs charged with bacilli were scattered over the land. It will be remembered, however, that the attempt to cope in a somewhat similar manner with an allied troublesome rodent, the rabbit, in Australia, was not rewarded with success.

The Departmental Committee of the Board of Agriculture, referred to on page 224, has been appointed to inquire into, and to report upon, the circumstances attending the existing plague of voles in some of the southern counties of Scotland; and to ascertain, either experimentally or otherwise, whether any, and if so what, preventive and remedial measures can be adopted, and under what conditions such measures are likely to be of value. The Chairman of the Committee is Sir Herbert Maxwell, Bart., M.P., and the Secretary is Mr. J. E. Harting.

[1] *Gentleman's Magazine*, Vol. 24, 1754, p. 215.

THE EVOLUTION OF AGRICULTURAL IMPLEMENTS.—II.

In the previous part of this paper (see this Volume, pp. 49 to 70) I dealt with the three sections of implements respectively adapted to purposes of tillage, seeding, and harvesting. I now proceed to discuss the remaining sections of implements as classified on page 52. These, it may be remembered, comprise (4) machines for preparing crops for market, (5) machines for preparing crops for food, and (6) dairying appliances, to which are added (7) prime movers, (8) drainage machinery, and (9) appliances for the reclamation of land.

Class IV.—Machines for Preparing Crops for Market.

Threshing-machines.—The first attempts to substitute power for manual labour in the threshing of grain were directed to the revolution of a number of flails striking a floor on which the grain was spread. Such was the contrivance of Michael Menzies, described in the *Gentleman's Magazine* for 1735, and in the *Transactions of the Society of Improvers in the Knowledge of Agriculture in Scotland*, these being the earliest published accounts of a power threshing-machine.

Menzies's machine proved a failure, but it had been noticed that if an ear of wheat be squeezed between two blunt edges the grain will be spirted aside, a fact of which Alderton tried to take advantage in 1772. He constructed a machine of two rollers, one with cellular and the other with fluted surfaces, passing the grain between which he anticipated that the kernels would be squeezed out of their husks and, falling into the cells provided for their reception, be finally discharged by the continued revolution of the cylinder. In 1785, Winlaw followed Alderton's lead with a machine consisting of two conical fluted rollers set vertically, but both these schemes proved failures.

In 1788, Andrew Meikle, millwright, of Whitekirk, East Lothian, patented a threshing-machine which combined the blow of the flail with the rubbing action of the threshing-floor, upon which the ox's hoof still treads out the grain in the East. The stroke of the flail was given by means of beaters fastened to a revolving drum, while the rubbing action arising between

hoof and floor was obtained by allowing the beaters to force the grain against the ribs of a sparred concave placed below the drum and held in place by weighted levers. The corn was fed into the machine by means of fluted rollers, and while most of the threshed ears fell through the concave, such as passed away with the straw were separated from it by the action of a jogging screen, which received the latter on its exit from the drum.

Two fans were used in Meikle's machine, the first for separating the chaff, after which operation the partially cleaned grain was elevated into a scourer or hummeller, whence it was discharged on to the screens of the second fan, thus completing the dressing. This "double-blast" system of cleaning was patented by Meikle and Machell in 1768, or twenty years before the invention of the threshing-machine, to which the Scotch millwright was the first to apply it.

Three early inventors claim the introduction of the rotary straw-shaker, the next step in the development of the threshing-machine, viz. Gladstone, of Castle Douglas, 1794; Baily, of Northumberland, 1798; and Palmer, 1799; but there is reason to believe that, though not included in Meikle's patent of 1788, rotary straw-shakers were used by him in some of his earliest machines. The modern straw-shaker dates from 1829 to 1837, there being two claimants for the invention, viz. Docker, of Findon, 1829; and Ritchie, of Melrose, 1837.

In 1805, John Ball, of Norfolk, patented a machine, having a concave of iron bars and a drum, designed for simply separating the corn from the straw. This thresher rapidly became popular, especially in the Eastern and Northern counties, and was exhibited in large numbers at all the early Meetings of the Royal Agricultural Society, where it is now rarely seen, although still remaining popular in Ireland.

A century has elapsed since Meikle's day, but the threshing-machine is still an improvable piece of mechanism. The proportions of straw to ear, of ear to grain, of grain to chaff, the kind and quantity of weeds and foreign seeds in the crop, the dryness and consequent brittleness of straw and grain, the season of threshing, the age of the stack—these, and a thousand other minor conditions, differ enormously in every country, with every season, and on every farm. Meanwhile, the threshing-machine maker depends for success entirely upon experiment, the application of theory to his work being out of the question. It is not surprising, therefore, that several generations of agricultural mechanicians should have passed away before the modern threshing-machine became as well correlated as it now

is with such an extraordinary diversity of conditions as it is required to meet.

Passing over, then, as indescribable the labours of the men intervening between Meikle's age and the present day, a brief account must be given of modern threshers, which may be classified either as double-blast, or finishing, and single-blast, or non-finishing machines. In the finishing machine the grain, after being threshed by the drum, is first separated from cavings and chaff, afterwards from dirt and seeds, and finally into different sizes of grain. It is in regard to the last two operations that modern improvements are most conspicuous. Only a few years back there were no machines capable of finishing for market unless the crop was in good condition; now, good samples are obtained even from the foulest grain.

This has been accomplished by incorporating with the threshing-machine a cleaning and sizing machine called the "second dresser," which separates such chaff, seeds, or dirt as are not extracted in the first dresser, while any uncleaned grain is returned to the riddle, whence it passes a second, or even a third, time through the drum. The thoroughly cleaned grain falls into a revolving screen, having three different-sized meshes, whence it is finally discharged, either as first, second, or third quality, into separate sacks, ready for market. The single-blast machine does not finish for market, but is used in threshing for the granary by farmers who do not intend to market their corn immediately.

Cornes, of Market Drayton, was the first, in 1847, and Hayes, in 1853, to exhibit straw elevators, or stacking-machines, such as those already described, applied to the threshing-machine. Hayes's plans were adopted and improved by Clayton and Shuttleworth, but it was not till after the expiration of Hayes's patent, in 1867, that this useful instrument came into general use. In 1879, Messrs. Nalder and Co. first exhibited a threshing-machine of which the stacker forms an integral part, the endless chain of rake teeth rising from its framework instead of from an independent carriage, and being arranged to swing around a supporting pivot, like a crane, so as to deliver the straw in any direction.

Still more recently, in 1883, Messrs. J. and F. Howard, of Bedford, first succeeded in adapting the sheaf-binding apparatus, already described under Harvesting Implements, to the threshing-machine. The straw coming from the straw-shaker is first "packed," and then bound with string, exactly as in the self-binding reaper, the trusses so bound being delivered to the stacker, if intended for the rick, to the cart, if for straw market.

An Act of Parliament, passed in 1878, requires that every steam threshing-machine shall be provided with such a guard as will effectually prevent the man engaged in feeding it from being drawn, or falling accidentally, into the drum. Previously to this, however, or in 1871, Mr. Wilder had patented a safety feed which, especially since the passing of the Act in question, has been adopted by several eminent makers. Wilder's guard is, in effect, a small straw-shaker delivering sheaves to the drum and fed by an attendant, who himself stands in a place of safety.

Drum-guards are now very numerous, and the subjects of many patents, but they all depend on one of two principles. On the one hand, it is assumed that the feeder is quite safe so long as he is in his box, and that only when he is out of it can he possibly fall into the drum. The guard, in this case, consists of a cover which keeps the mouth of the machine permanently closed until the feeder gets into place, when his weight, depressing the bottom of the feed-box, gives movement to levers which open the drum-guard. In the other case, matters are so arranged that upon any undue pressure coming, either on the feeding board, or on a curved hood which half covers the mouth, the latter is closed by a self-acting shutter.

Winnowing-machines.—Although the fan was used as a means of separating the chaff from the wheat by many peoples of antiquity, it is scarcely a century ago since the winnowing-machine was first patented in England, Cooch, of Harlesden, being the inventor, and the date of his patent June, 1800. It is an interesting and somewhat remarkable fact that one of Cooch's first machines, which had been in practical use at that time for seventy-nine years, was on view at the Royal Agricultural Society's Show at Kilburn in 1879, among a number of ancient implements brought together in the comparative museum which formed a part of the exhibition.

The finishing thresher has atrophied the winnower proper, which latter machine remains pretty much the same simple combination of riddles and fan-blast as in Cooch's day, while the former has absorbed into itself many of the important improvements in dressing and cleaning corn made during recent years in connection with milling.

In 1858, Mr. Childs first introduced from America an exhaust fan designed to take the place of a blower for cleaning grain in conjunction with riddles, and this successful innovation, subsequently improved by his patent of 1864, came rapidly into general use. Underhill, in 1859, first applied an exhaust fan to the threshing-machine, and Clayton and Shuttleworth, having acquired his patents, soon used the exhaust both for the bagging

of chaff and in the rotary corn-screens, first introduced by Penny in 1860, for cleaning and sizing grain. Since the expiry of Underhill's patent, in 1873, the use of a separate exhaust fan for bagging chaff has become general, while in 1881, Foden, of Sandbach, patented a method for making one exhaust fan do the whole work of a threshing-machine, and with such a thresher the same maker took the first prize at the Society's recent trials at Doncaster in 1891.

In 1876, Walworth and Co., of Bradford, introduced a simple machine for cleaning grain, in which riddles are entirely dispensed with and separation is effected by means of gravity alone. In this dresser, corn, falling through an exhausted chamber, is arrested six times in succession by as many inclined wooden shelves, beneath each of which air rushes into the partial vacuum created by the fan. The grain is thus many times weighed, so to speak, in a delicate air balance, and the resulting samples are each composed of grains of exactly the same specific gravity.

Class V.—Machines for Preparing Crops for Food.

Grinding Mills.—Although not, strictly speaking, agricultural machines, corn mills cannot properly be excluded from this paper without remark, all the more imperatively demanded because milling, perhaps the oldest of all mechanical processes, is just now undergoing something very like a revolution. For several years past the English miller has found himself increasingly unable to compete with his Hungarian and American rivals in the production of the finer qualities of flour, and his eyes have been recently opened to the fact that he must either adopt new methods of grinding or be beaten by his foreign competitors.

"Roller milling,"—under some form of which process the countries in question have obtained their commanding position in the markets for fine flour,—came into use in the following way. Hungarian and American wheats have extremely thin, brittle skins, which, when ground in the ordinary manner, are broken up into the finest particles, and, passing through the dressing-machine with the meal, give the latter a dark colour, greatly diminishing its commercial value. Where, as in England, wheat has a tough skin, "low grinding" under millstones gives satisfactory results, the bran becoming flattened into flakes, easily separable from the flour, and themselves commercially valuable by reason of their large size. But, probably, two-thirds of the grain now ground in Great Britain is of foreign growth.

So long as the Continental public was not fastidious in the matter of its bread, the dark flours which "low grinding" produces from hard wheats found a sale abroad. But the taste of the consumer has grown refined of late years, so that, first, the Austro-Hungarian, and then the American millers, found themselves obliged to march with the times. Hence arose the practice of "high grinding," or setting the millstones just so far apart that they crack the wheat berry into small particles, but do not grind it to powder. The cracking is repeated several times, and the products, called middlings, or "semolina," are winnowed after every operation, and the fragments of the interior of the wheat berry which remain are then crushed under "low grinding" stones into flour.

By this system at least three qualities of flour are produced—viz. that from the first grinding, that from the pure, and that from the branny semolina. The first of these contains all the impurities which cling, even after careful cleaning, to the wheat berry; the second is finer and whiter flour than can possibly be produced by low grinding; while the third is a coarse branny flour.

The success of high grinding depends on finding markets at high prices for the finest flours, and, fifteen years ago, these were selling in England for from 10*s.* to 20*s.* a sack more than the home-made article. For a long time, indeed, the Continental miller was able to dispose of all his fine flours at a high price abroad, while he found a market at home for the inferior bran flours.

But this state of affairs did not last. America adopted the "new process," and exploited it with her usual energy. Middlings flour was produced regardless of yields, for, at the prices then ruling, the miller could afford to ignore the quantity of wheat required to make a barrel of flour. The demand for very fine flour is, however, limited, and as the price of "patent flour" was pulled down the question of yields forced itself again on the miller's attention. Then came modifications of the "new process," going by various names, and, finally, the system of "gradual reduction" by means of roller mills.

Roller mills were introduced experimentally in Switzerland about 1825, and installed on a large scale, in 1838, at Buda-Pesth, which town may be considered as the cradle of the system.[1] The recently discovered work of Wilhelm Fritzch on

[1] [*Editorial Note.*]—In the course of a visit to Hungary, in the autumn of 1890, I took the opportunity of thoroughly inspecting at Buda-Pesth the first roller-mill ever established, now one of the largest in the world. This mill has had quite a history. It was founded in 1838, by the famous Count

Anglo-American and Swiss Science Milling, published at Leipzig in 1847, fully describes these early mills, while Mortimer, writing in 1710, gives an engraving of a roller mill which he highly commends.

In "gradual reduction" by rollers, the wheat, having been first cleaned, is led between a pair of fluted and differentially speeded rollers, which are set so as scarcely to allow the grain to pass between them. The corn is thus cracked, after which it is sifted for the removal of any dust that may have been disengaged. It next passes between another pair of rollers, more closely set than the first, which break the grain again; the resultant meal is sifted, and some semolina, accompanied by a little break-flour, is obtained. These operations are repeated again and again, but always between closer rollers and with finer sieves, until most of the inner part of the berry has been freed from the bran.

A meal is thus produced which consists of middlings of various sizes, particles of bran of corresponding sizes, and break-flour. The last is sifted out, and then the semolina is winnowed in order to free it from bran. But, as the same amount of wind which would suit the larger fragments would blow away the smaller ones, the meal is first sized, by wire

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Stephan Széchenyi, the great Hungarian patriot, who in his study of methods for raising the fortunes of his then down-trodden country, was attracted by the possibilities of the roller-milling system, the invention of an engineer named Sulzberger. Thinking it a pity that Hungarians should not reap the profits of the wheat grown in Hungary, Count Széchenyi induced Baron von Reibegg, the head of a substantial house at Botzen (Tyrol), to provide half the sum (300,000 florins) required to erect a steam mill at Pesth, on condition that the other half was raised in the country itself. This was done, and the "Pesti-Hengermalom Tarsasag," or Pesth Cylinder Flour Mill Company, was established on December 26, 1838. The company had at the outset to conquer innumerable difficulties. It could only acquire a site at an extravagant figure; rival mill-owners alleged that the new system produced unwholesome flour; competent workmen were difficult to obtain, and as there were no good iron works at Pesth, the company had to establish a small machine factory of its own. Notwithstanding all its troubles, however, the company gradually made its way, and it paid for its first working year, 1844–5, 6 per cent., and for the two following years, 12 per cent. In the troublous times of 1848–9 it sustained heavy losses, and its factory was converted into an armoury for the Hungarian Government, subsequently falling into the hands of the Austrians. The company was only beginning to recover when, in 1850, the whole structure was burnt to the ground. Rising from its ashes, it went on prospering until the great constitutional changes of 1867, which put an end to its practical monopoly. The company, however, appears to have kept well abreast of its now numerous roller-milling rivals at Pesth, and successive enlargements have been made to meet the requirements of the times. Something like sixty different processes are required before the grains of wheat are converted by a system of gradual reduction by steel rollers into the finest Hungarian flour. The motive power at this mill is supplied by steam engines of 1,200 horse-power, and the astounding quantity of 80,000 tons of flour is turned out every year.
E. C.

cloths and silk gauzes, into a number of different qualities, and these, after being purified of bran by air currents of suitable strength, are separately crushed into flour between smooth rollers.

Sifting or "dressing," and winnowing or "purifying," are both extremely important elements in the gradual reduction of wheat to flour by roller mills. A word or two will suffice to indicate what has been done of late years in dressing-machines. Wire cylinders and brushes gave way more than thirty years ago before silk screens, which, though very effective in work, are cumbrously long. Shorter cylinders have lately been introduced, containing revolving beaters, which throw the meal repeatedly but lightly against the silks, and thus greatly expedite the operation of dressing.

The middlings purifier is one of the most important pieces of machinery connected with roller milling. By its means the semolinas, which it is the object of gradual reduction to produce, are freed from the small particles of bran mixed up with them, and are themselves separated, according to their densities, into lighter and heavier samples. No sifting can accomplish this, because the middlings and bran are often of the same sizes although differing in specific gravity.

In the purifiers now universally employed in Austria and Hungary, a stream of semolina falls through a vertical pipe fitted with baffle boards, so arranged as to cause the stream to cross and recross the pipe repeatedly, while the current of air is sucked upwards through the latter by means of an exhaust fan. The strength of the current can be regulated so as to carry away the whole stream of semolina, or only the lightest particles of bran.

In a second type of machine, finding much favour both in England and America, the purifier consists of a combination of silk riddles and exhaust. The former are given a downward beat by the action of a pair of cams, which, compressing four india-rubber balls acting as springs at the corners of the riddle frame, cause the riddles to rise and strike against a stationary buffer; and the sudden stopping of the sieves, throwing the middlings into suspension, enables the exhaust to act with the greatest effect upon them. The air current, sweeping upward through the silks, carries the lightest particles away altogether, depositing them in a chamber provided for their reception, while the heavy granules of semolina fall through the riddles. The branny particles floating on the silks, through which the air current prevents them from passing, are ultimately discharged as overtails.

Should roller milling succeed, as will probably be the case, in altogether displacing stones, the importance of such a revolution may be best measured by the fact that 125,000 horse-power and 18,000 pairs of stones are still employed in grinding flour in the British Islands.

Cattle Food Preparing Machines.—It was rare, at the beginning of this century, to see either a corn-kibbler, a chaff-cutter, or a root-cutter, at work upon any farm, while the oilcake breaker and the gorse mill were not as yet known. But, since the dependence of English agriculture upon live stock has been more and more fully demonstrated, cattle-food preparing machines have become the largest class of implements at all agricultural shows, and the prosperity of the farmer may indeed be estimated by the use he makes of them.

Farm Corn Mills.—Grinding for the purpose of cattle and pig feeding has assumed considerable importance since corn has become cheap, and the farmer has always on hand a considerable stock of tail-corn, which, in days antecedent to the finishing threshing-machine, found its way to market in the wheat sacks.

Mill stones and roller mills are ill-suited for gristing, which is now generally accomplished by means of metal mills.

Metal Discs were first used by Napoleon on the march to Moscow for the purpose of supplying his troops with meal. The "French Military Mill," as it was called, consisted of a pair of cast-iron discs about 12 inches in diameter, vertically arranged, and turned by hand.

Conoidal Metal Discs were invented by David Selden, of Liverpool, in 1831.

Grooved Roller and Breast.—In 1833, a certain Thomas Don, of Westminster, patented a vertical millstone which bore peripherally against the segmental curve of a second stone of rather larger radius than the runner; but Don was himself anticipated by Charles Williams, of Southwark, who, in 1810, made a metal mill consisting of a grooved roller working against a breast formed of a number of knives, screwed together so as to form the same curve as the roller, the knives being removable for the purpose of sharpening. The roller in Williams's machine was kept up to the breast by weighted levers, which, while furnishing pressure enough for the purpose of grinding, allowed the breast to give way, exactly as in modern practice, on the passage through the mill of hard foreign substances.

Conical Roller and Breast, giving endwise delivery of Meal.—Amory Felton, an American, seems to have been the first inventor, in 1855, of the horizontal conical roller and breast, which,

introduced into this country by Riches and Watts in 1857, became a model for the well-known, and now widely-distributed, Barford and Perkins's gristing-mill.

The Royal Agricultural Society's Trials at Plymouth in 1890 may be regarded as an attempt to select from among modern improvements upon the systems of grinding above described that which is best fitted for a farmer's use; and, having regard strictly to this problem, the experiments gave no uncertain sound in declaring that flat metal discs have the greatest general adaptability for grist-milling, while they are economical of power and time, produce good feeding samples, and are cheaper, both in first cost and renewals, than any other mills.

Chaff-cutters.—The cutting of hay or straw into short lengths does not greatly facilitate digestion, for whatever material of this kind is eaten by a ruminating animal is pretty sure of undergoing this process whether cut or not. It is only because chaff-cutting facilitates the admixture of more nutritious matter with hay or straw that its use has become universal.

Three different principles of construction have struggled for existence in the chaff-cutter. In Salmon's, Passmore's, and Clyburn's machines, dated respectively 1797, 1804, and 1840, spiral cylindrical knives were employed, giving either an intermittent or continuous cut. In Gillett's machine, dated 1846, an oscillating knife moved vertically up and down in guides like the blade of a guillotine, whence this implement took its name. Finally, in Cornes's machine, first shown in 1847, the knives were arranged radially, cutting from the centre outwards, as they do in all the chaff-engines of the present day.

Later improvements have consisted chiefly in details of construction; in the application of the chaff-cutter to the threshing machines, whereby the straw is cut and bagged as fast as it issues from the straw-shaker; and in the addition to these machines of arrangements by which, should the feeder get caught in the feed-rolls, his body, being drawn forward, presses against a lever which throws the machine out of gear, and ensures the man's safety.

Turnip cutters are remarkable for the fact that they have remained absolutely unchanged since their first introduction by Gardner of Banbury, now more than fifty years ago; while—

Oil-cake breakers, used by Coke of Holkham and the Duke of Bedford before the commencement of the present century, consist of a pair of serrated discs working into one another, but have no mechanical features of interest to describe.

Gorse mills are a modern invention for the reduction of furze to a pulp soft enough to be mixed with the food of dairy cows.

In the best examples of these machines, two masticating cylinders, each consisting of a series of saw-like discs, separated by washers, work into each other so closely that the prickles of the gorse cannot escape between them. This mill, already in extensive use, ought to encourage the growth of gorse on such tracts of land as are incapable of supporting other crops, the butchers' meat and dairy produce of gorse-fed animals being of superior quality.

Class VI.—Dairying Appliances.

British Dairying, like British Milling, is just now undergoing certain revolutionary changes, of which, interesting as they are, it would be impossible to give any adequate account in an essay not specially devoted to the subject. In the matter of dairying, too, agricultural and mechanical considerations are so inextricably mixed up, that to attempt an exhaustive account of dairy appliances, without lengthened reference to the agricultural conditions with which they are correlated, would render such descriptions unsatisfactory and even unintelligible. All that can be done, under these circumstances, is to indicate the character of the revolution in question, and to name, without describing in detail, the instruments by which it is being carried out.

Twenty-five years ago, hardly any foreign butter or cheese was imported into this country, but not a hundredth part of the butter eaten in London is now of British origin. Great Britain, indeed, buys yearly 16,000,000*l.* worth of butter and cheese from the foreigner, having lost a trade during the period in question which is nearly equal to half her cotton imports.

Nor is the reason of this lapse very far to seek. The attention of British breeders for many years past has been almost exclusively given to the improvement of meat-yielding animals, while the improvement of the milch cow has been correspondingly neglected. In the endeavour to produce beef commanding high prices, dairy produce has been considered a matter of minor importance, and the foreigner has thus gained a footing in our markets from which he might easily have been excluded if breeding for milk, instead of for meat, had been the order of the day among English farmers during the last quarter of a century.

Now, however, when beef is landed as cheaply as it is grown in England, the farmer has begun to realise that a wide field is open to the dairy-farmer, and to ask the breeder on the one hand, and the mechanician on the other, for assistance in cultivating it.

In reply to this appeal, the mechanic says that a system under which each dairy-farmer converts his own small quantity of milk, whether into butter or cheese, is a wasteful one, and recommends that the raw material be sent to some central factory, where, large quantities of milk being treated together, manual labour could be displaced by machinery, while the quality of the products would be improved.

Such factories, or "creameries," as they are called in America, where they are universal, are now being tentatively introduced into England, the most important of these establishments being the Duke of Westminster's Aldford Cheese Factory, Lord Vernon's Sudbury Creamery, the Dunragit Creamery Company, and the Berkeley Vale Shorthorn Dairy Company. Briefly to describe a "creamery," whether American or English, will be to exhibit in as much detail as is here admissible the aids which, up to the present time, have been placed at the service of the dairyman by the agricultural engineer.

Milk, on arriving at the butter factory, is first weighed in specially contrived scales, whence it is tipped into a neighbouring tank. No milk is received unless of a given specific gravity, or at a higher temperature than 80° F. From the tank, the milk flows into the "cream separator," a device which was first applied to the separation of cream from milk by Laval about 1879. Laval's separator consists of a cylinder rotating at a speed of six or seven thousand turns per minute. Whole milk, admitted to this whirling vessel, parts with its cream in the following way. The heavy milk is thrown outwards to the circumference of the separator, while the lighter cream remains, floating upon the milk nearer the centre of the centrifuge, each liquid being withdrawn from its respective zone through suitable pipes.

Laval's separator having proved a great improvement on the old plan of "setting," has given birth to a number of other machines having similar functions, all of which must, however, be considered as modifications of a centrifuge, patented by Weston of Boston, U.S.A., in 1867, for the purpose of "separating liquids from paint and other solid substances."

From the separator, the cream passes into the churn, an instrument protean in form, but needing no description. When the butter has "come," it is removed by wooden scoops and transferred to the "butter-worker." This machine, to which the French and Dutch dairymen owe much of their success in supplying the English market with a uniform sample of butter, is an extremely simple contrivance. In its best-known form, it consists of a revolving table, sloping slightly from the centre to the circumference, upon which the butter is squeezed under a

conical fluted roller, the expressed butter-milk flowing away by a peripheral channel. From the butter-worker, the butter is removed in masses to a cold-air chamber, whence it is taken out as needed, weighed, and made up into pats of any required shape for the market.

The machinery of a creamery is driven by a steam engine, whose power is, of course, determined by the amount of butter made per day. Steam from the boiler is conducted through all the rooms for the purpose of warming, evaporating, and heating. The cans and other apparatus are cleaned in the rinsing room, which is supplied with steam-heated water, and, in the best creameries, the floors are made of cement, laid with a slight slope so that they can be rapidly washed down with jets of water.

It will be noted that the name of Salmon has recurred somewhat often in the course of this paper, and, before passing away from the consideration of agricultural machinery proper to that of the accessory apparatus forming classes 7, 8, and 9, it is only right that a few moments should be spent in doing tardy justice to the memory of a very able mechanician, whose labours in the field under review have been of singular importance.

Robert Salmon was for thirty years, or from 1790 to 1821, surveyor to the "farming" Duke of Bedford and his successor. It was the former Duke's custom to hold a "sheep-shearing" annually at Woburn, and to make this the occasion for the exhibition of agricultural implements, for any meritorious novelties in which prizes were awarded. Mr. Salmon was a constant exhibitor of new inventions at these shows, and it will sufficiently demonstrate the high mechanical genius of the man shortly to catalogue his chief contributions to them.

In 1797 the Society of Arts awarded him 30 guineas for a chaff-cutting engine, the same machine as has already been referred to as the parent of all the modern chaff-cutters. At the "sheep-shearing" of 1801, Mr. Salmon exhibited his Bedfordshire Drill, which became the model of all succeeding drills. In 1803 he showed a plough wherein the slade was replaced by a skew wheel, as in Pirie's modern double-furrow plough. In 1804 he brought out an excellent "Scuffler," or Cultivator. Two years later, in 1806, he exhibited a self-raking reaping machine; but, the Duke of Bedford's death having interfered for a time with the Woburn prize system, neither this implement, nor a threshing-machine shown with it, attracted any public

notice. In 1808, however, the Duke's prize system being again revived, Salmon's reaper was described in *Bell's Weekly Messenger*, and it is a remarkable fact that this early machine embodied all the principles of the modern self-raker, which was not introduced until nearly sixty years later.

In 1814 Salmon patented the first hay-making machine, to which modern improvement has added nothing new but details. He received, at various times, silver medals from the Society of Arts for surgical instruments, a canal lock, apparatus for pruning trees, a man-trap, and earth walls; but, perhaps, his most important work was the designing of the Duke of Bedford's Home Farm and Estate Buildings at Woburn.

This great obscure mechanician died at Woburn in 1821, aged 69, the event being shortly recorded in the *Gentleman's Magazine* for that year. Mr. Salmon is there spoken of as "well known and respected by the admirers of the fine arts and sciences, the inventor of many useful and valuable instruments of surgery, agriculture, and hydraulics."[1]

Class VII.—Prime Movers.

Agricultural prime-movers fall naturally into the following groups:—

1. Portable engines, single and compound.
2. Straw-burning engines.
3. Self-moving engines.

Although portable engines were made the subject of many patents during the latter half of the last century, nothing of practical value resulted from these various inventions until the Royal Agricultural Society commenced its useful labours for the encouragement of steam in its application to cultivation.

Watt, indeed, himself patented a portable engine in 1784, and Trevithick's fixed engine, exhibited at the Kilburn Show Museum already alluded to, was actually used in 1811 for driving a threshing-machine belonging to Sir Christopher Hawkins. Lester, in 1814, patented a self-moving portable engine, designed for transporting as well as driving the threshing-machine; and Heathcote, in 1832, patented an engine on wheels to be used for drainage purposes, of which more hereafter.

No mention is made of steam engines at the Royal Agricultural Society's Shows of 1839 and 1840, although it is said that Wingate of Hareby, and Morton, Earl Ducie's manager, urged the Tuxfords

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[1] See *Journal*, Vol. II., *Third Series*, Part I., 1891, page 132.

of Boston to bring out a portable steam-threshing machine as early as 1839. They did so in 1842; but, meanwhile, Ransomes of Ipswich became entitled to the credit of showing the first portable engine at the Liverpool Meeting of the Royal Agricultural Society in 1841. This was a two-wheeled affair; followed, however, by a four-wheeled engine, exhibited by the same firm at the Bristol Show of 1842, where three other engines on wheels made their first appearance.

Ten years after the exhibition of the first portable engine, a writer in this Journal for 1851 estimated the number of these motors in the United Kingdom at 8,000, while, at the present time, adding exported agricultural engines to those which have remained at home, these are, together, as the sands of the sea in number. At least 5,000 agricultural engines of various kinds are now manufactured annually in this country.

Under the stimulus of competitive trials the portable engine realised a great economy in coal at a very early period, and the progressive record of the Royal Agricultural Society is very significant of the influence which the prize system had in bringing this about. The prize engine of 1849 burned $11\frac{1}{2}$ lb. of coal per horse-power per hour; that of 1850, $7\frac{1}{2}$ lb.; of 1852, $4\frac{5}{8}$ lb.; of 1853, $4\frac{1}{3}$ lb.; of 1855, $3\frac{3}{4}$ lb.; of 1856, $3\frac{1}{2}$ lb., and of 1872, 2·8 lb. The more remarkable of these results were obtained by crowding the boiler with tubes, by pinching the area of the firegrate to such a degree that only a trained stoker could keep his steam, and by using refined expansion gear requiring skilled handling. Such engines soon became known as "racers" and were never supplied to farmers, the "commercial" engine which *was* sold always averaging a consumption of coal about double that of racing engines.

The fact that the farmer is still practically without an economical engine has recently led to the introduction of compound portable engines, which effect all the economy obtained by the "racers," while using boilers of good construction and simple valves. The first compound engine ever seen at a Royal Show was exhibited by Messrs. John Fowler and Co., at Kilburn, in 1879. It was, however, only semi-portable, and it was reserved for Messrs. Garrett and Sons to bring out the first portable compound engine at Carlisle in 1880, a lead which has been quickly followed by several eminent makers. It was a compound engine, by Messrs. Davey, Paxman, and Co., that beat all previous records of economy at the Newcastle trials of 1887, while conclusively proving the suitability of this type of engine for use on the farm.

Straw-burning engines are now largely used in countries where

coal is dear and the climate dry enough to permit of grain being threshed very soon after it has been harvested.

Head and Schemioth, in 1872, were among the first to experiment on the combustion of straw in steam-boilers, which they accomplished by fitting a feed-box and pair of rollers to the furnace-door of an ordinary portable engine. The feed-rollers are driven by a strap from the crank shaft, and force straw into the furnace in a thin, fan-shaped stream. The fuel is thus held in suspension, so to speak, for a short time, allowing the separated stalks to become immersed in the flames, while provision is made for the ingress of large quantities of atmospheric air to the fire-box. The consumption of straw in Head and Schemioth's engine is approximately from 15 to 18 lb. per horse-power per hour.

Messrs. Clayton and Shuttleworth have introduced a straw-burner which consists in the addition of a combustion chamber to the ordinary firebox, the two being separated by a bridge and baffle-plate, and it is claimed that the increased space and heating surface obtained by this arrangement suffice, together, for the complete combustion of the straw. Messrs. Clayton and Shuttleworth are responsible for the statement that this engine consumes only 14 lb. of straw per horse-power per hour.

Elworthy's patent straw-burner, manufactured by Clayton and Shuttleworth, is applicable to the ordinary portable engine, and consists of a tubular mouthpiece, taking the place of the firedoor, of a cast-iron hopper to fit the lower part of the inner firebox, provided with rocking grate-bars which can be agitated by a handle from without; and a set of baffle-plates extending diagonally across the upper part of the firebox, which cause the flames to play upon the firebox sides before passing through the tubes.

The calorific value of straw is as 1 to $3\frac{1}{2}$ compared with coal, or, taking the relative local values of coal and straw into consideration, the use of the former would cost $3\frac{1}{2}$ times more than the latter in countries like Russia and Hungary. In England, on the other hand, coal is the cheaper fuel by 5 to 1, partly because of its own low price, and partly because of the high price of straw.

Petroleum Engines.—To Messrs. Priestman Bros. belongs the credit of having demonstrated the suitability of the petroleum engine for farm purposes. This motor proved more economical of fuel than good portable engines at the Plymouth trials of 1890, while the character of the petroleum employed is such as to remove all fear of accidents from its use. It is probable that there will be an increased use of petroleum motors for agricultural purposes.

Self-moving Engines.—For many years after its introduction the portable engine was drawn from place to place by horses, and, numerous as were the early patents taken out for traction engines, it was not till about 1860 that they won their way to the front. Boydell and Bray were conspicuous among the early workers in this field, the former fitting his wheels with an endless rail, and the latter with projecting teeth, in the years 1854 and 1856 respectively. In 1859, Clayton and Shuttleworth, discarding all additions to the driving wheels, first showed the way to a practical traction engine, and introduced a design which has since been generally adopted.

Self-moving engines have been greatly improved during recent years in three important particulars. In 1870, Messrs. Aveling and Porter prolonged the side-plates of the firebox upwards, forming these into brackets for carrying the bearings of the crank and counter-shafts, thus relieving the boiler from undue local strains. Previously to 1878, again, the gearing of self-moving engines had always been placed outside the crank brackets; but in that year, for the first time, Messrs. Aveling and Porter succeeded in bringing all the wheels and pinions between the bearings, and the driving and side wheels close up to the side-plate brackets. By this arrangement the engine became greatly strengthened, its wear and tear correspondingly reduced, its width lessened, and its compactness increased.

Within the last few years several patents have been taken out for traction-engine wheels with spring connections between the felloes and the tires. The object is to reduce wear and tear generally, and to prevent such vibrations as occur in passing over rough roads from materially affecting the depth at which the toothed wheels gear into one another. To judge from the fact that spring wheels have suddenly become a favourite subject for patents with the chief makers of traction engines it seems probable that this innovation will soon be recognised as a valuable improvement.

Messrs. John Fowler and Co.'s important contributions to the solution of the traction engine problem have already been indicated under the head of Steam Cultivation, to which side of the question this firm's attention has, from the first, been chiefly turned.

Class VIII.—Drainage Appliances.

"Nothing," said Mr. Coleman, reporting on the Royal Agricultural Society's Show of 1881, "can be conceived of in the way of aid to suffering agriculture more valuable than a really efficient draining tool;" but this problem has yet to be resolved

by the mechanician. It has been attacked in three different ways, viz., by—

1. Drain-ploughs for making open grips.
2. Mole-ploughs.
3. Rotary excavators, supplemented by apparatus for laying and covering the drain-pipes.

Drain-ploughs, first introduced by McEwan, a tenant-farmer of Stirlingshire, were much in vogue about the beginning of this century, and are frequently noticed by agricultural writers of that period. McEwan's plough cut a furrow slice some 18 inches wide and 14 inches deep by means of two coulters, while a shovel-shaped share lifted the slice to the surface. A second similar implement followed the first, and deepened the grip to 18 or 22 inches, some twelve horses being required to haul the plough through strong clay land free from stones. Alexander of Taylorton, Stirlingshire, improved on McEwan's drain-plough in 1840, the first plough taking out a spit of 17, and the second a spit of 10 inches deep.

Early experimenters in steam-ploughing, notably Mr. Heathcote, of Tiverton, proposed hauling such ploughs as those of McEwan and Alexander by steam-power, and Heathcote, indeed, not only patented plans for this purpose in 1832, but reduced them to practice more than fifty years ago.

At the Royal Show of 1871, Fowler showed a steam ditching-machine, and at the Inventions Exhibition of 1885 another very large and powerful implement of similar type, on the balance principle, for use in India and the Colonies.

The mole-plough, sufficiently characterised by its name, consists of a beam and stilts, furnished with a strong coulter. adjustable vertically, whose lower extremity terminates in a short pointed round iron bar, horizontally disposed. The plough-beam, resting on the ground, forms a gauge for the depth at which the drain is formed, and the machine is forcibly dragged through the soil by means of a chain and capstan. The tunnels thus produced are very similar to mole runs, and, in tenacious soils, will remain open for a considerable length of time.

Fowler's first patent, of 1852, for a mole-plough, is directed to dragging a string of drain-pipes into such a tunnel with a view of rendering it permanent. Two years later, however, or in 1854, he proposed the use of steam haulage, and his steam draining-plough, after a severe trial at the Royal Show of 1854, was much praised by the Judges of Implements.

Shortly after this, Mr. Fowler, devoting himself exclusively to the problem of steam-ploughing, handed over his draining-plough to Mr. Eddington, of Chelmsford, who improved it

greatly by a patent, dated 1862, whereby the machine was, for the first time, made capable of laying pipes on an incline. In spite, however, of much skill and ingenuity lavished on the problem of mole-ploughs, these, together with drain-ploughs, have receded in public favour of late years, probably because they have proved unable to compete successfully with the ordinary hand drainage tools.

It remains to notice the third, or rotary, class of draining appliances for which many patents, both English and American, have been taken out, without much visible approach to success. Such is Eddington's drainage tool, patented in 1865, a machine which opens the drain, lays down the pipes, and fills in again in the rear. Such also is Robson and Hardman's machine, exhibited at the Royal Agricultural Society's Show in 1881, looking like a stranded dredger, excavating by an endless chain of buckets, of which there are two series, one following, and cutting deeper than, the other. The body of the machine contains the drain-pipes, which descend, through a curved "pipe conductor," into the trench formed by the buckets, where they are left lying in sequence as the machine advances. The dug soil is elevated, just as in a dredger, and discharged into shoots, whence it falls back into the trench from which it was originally removed, covering the drain-pipes that have, meanwhile, been laid therein. Promising as it appeared at Derby, the Robson and Hardman appliance has, so far, rendered little practical service to agriculture, and with it closes the list of aspirants who have come forward at various times to claim the still unappropriated Gold Medal offered by the Royal Agricultural Society for a really good draining implement.

Class IX.—Appliances for the Reclamation of Land.

England is so often compared to a garden that Englishmen scarcely realise how many millions of acres of waste land still exist in these islands. More than one-fifth of all Ireland is uncultivated, Connaught, its smallest province, containing a million and a half of unreclaimed acres. In some parts of Scotland matters are worse. Sutherlandshire, for example, is hardly scratched by the plough, not a fortieth part of its area being yet under cultivation, notwithstanding the efforts at reclamation which have been made in this county by the Duke of Sutherland, in conjunction with Messrs. John Fowler and Co., of Leeds.

Heathcote, of Tiverton, already alluded to, was one of the first English landowners to undertake important works of drainage and reclamation by means of machinery, in 1832. Heath-

cote's patents were reduced to practice by Mr. Josiah Parkes, C.E., afterwards Engineer to the Royal Agricultural Society, who reclaimed Red Moss in Lancashire by the use of apparatus which really anticipated modern steam-tillage. An interesting illustrated account of Heathcote's plans is given in the Highland Society's Transactions for 1839, in which year a deputation from that society, headed by the Marquis of Tweeddale, visited Red Moss and reported on the work in progress.

In commencing the reclamation of a bog, a road was first traced by simply cutting two parallel drains about twenty feet apart. Upon this road was launched a steam-engine, furnished with a windlass, and carried upon an endless railway of sufficient width to secure its buoyancy when moving over the spongy ground. On either side of the road, and at a distance of some 200 yards from it, other roads were made in the same way as the first, and upon these were launched certain "auxiliary carriages" acting as anchors. Two ploughs travelled back and forth, one on either hand, between the engine and the anchors, which were both advanced by the width of a furrow after every bout. The plough was rendered buoyant by the use of wide wheels, its weight of $12\frac{1}{2}$ cwt. being distributed over 10 square feet of bog.

The engine had two cylinders, 10-inch diameter and 24-inch stroke; it burned from 1 to 2 tons of coal daily, and, propelling the plough at the rate of 2 miles an hour, turned over eight acres of bog per day. Such was the earliest practical effort made in this country to apply steam-power to cultivation, an effort which must always greatly redound to the credit both of Mr. Heathcote and his able lieutenant, Mr. Parkes.

Passing over certain reclamations of bog and moor in Galway, of which an excellent account by Mr. Roberts, of Haslemere, appeared in this Journal for 1878, it will suffice, in conclusion, to summarise a second report from the same hand, published in the Journal of 1879, describing the Sutherlandshire reclamations already alluded to.

About 1870 the Duke of Sutherland commenced his operations at Uppat with a common plough and portable engine, and here his Grace spent many hours watching this feeble implement battling with boulders and roots. The more mishaps befell the crude apparatus, the more determined the Duke became to carry out the work by means of steam-power, and, in 1871, a special plough and a pair of 14-horse power engines were procured from Messrs. John Fowler and Co. for the purpose. By this set of tackle, and after immense difficulties, the surface was at length ploughed, and a new era in the work of land-reclamation commenced. The Duke's operations extended

year by year, and the "Sutherland Plough" was gradually improved, until it became a strange-looking instrument indeed, but a perfectly efficient tool for the performance of work which no engineer would have considered within the compass of machinery ten or a dozen years before.

The plough is furnished with a single huge turn-furrow, and to prevent the implement burying itself in the spongy land it is carried on four broad wheels, or, rather, rollers. Two of these, forming the land wheels, are cylindrical in shape, while the two furrow wheels are great cones. The conical form is necessary for pressing the newly turned furrow-slice into its place; otherwise the tough sward would roll back into the furrows. The coulter consists of a steel disc, placed vertically in front of, and cutting the soil below, the sock. When this disc meets with a landfast stone or stump, which it can neither stir nor split, it rolls over it, and lifts the plough clear of the obstruction. Behind the plough proper, and pivoted to its framework, hangs the "Duke's toothpick," a huge iron hook, like the fluke of an anchor, which is brought into work by the action of the tail rope, and stirs the subsoil to the depth of from 8 to 18 inches. When the coulter rolls over obstructions, then the "toothpick" attacks them, the gear being strong enough to pull the engines up before anything gives way, and, where his Grace's persuader fails, dynamite is the only resource.

DAN. PIDGEON.

DESIRABLE AGRICULTURAL EXPERIMENTS.

UNTIL Nature has divulged all her secrets—if such a consummation is to be expected in the remote future—there will be unsolved problems in connection with Agriculture. By the aid of Science, and by means of experiments and ordinary experience, man has advanced in knowledge of the principles of his oldest art; but the progress has been slow, and, I venture to think, much slower than it would have been if more systematic efforts than have ever been made had been put forth with the object of throwing light upon questions which are either altogether obscure, or enveloped in a greater or less degree of uncertainty. There are points, indeed, of the most essential importance to farming as a business, which might be decided with at least a sufficient approach to exactness, to elucidate

which no systematic attempt has ever been made, although for generations they have presented themselves to the minds of agriculturists as riddles which men of that class have felt that they ought to be able to answer. With respect to some of these questions, which might have been elucidated by a few well-arranged experiments, it may fairly be said to be astonishing that they have been neglected through all the decades of improving agriculture. There are also other problems, raised by modern research, which it is no discredit to living or dead agriculturists not to have solved; and all that need be pleaded with respect to them is that they should not be treated with the same neglect as has been displayed in relation to older questions. It is the object of this paper to suggest a few experiments, which any agricultural association possessing moderate funds might carry out, with a fair prospect of conferring a great and enduring advantage upon the farmers of the present and the future.

Numerous and varied as agricultural experiments have been, it is strange that no well-known and publicly-conducted trial of the comparative consumption of food and production of meat or milk by cattle of the large and small breeds respectively has ever taken place in this country. The points in question have always been at issue, and if any attempt has ever been made to determine them, it is certain that no approach to a settlement has been attained. The small breeds have not yet become of much relative importance as meat-makers in this country, and therefore it is not surprising that their achievements in this respect, in comparison with those of the large breeds, have not been recorded. But the small breeds have long been of importance as producers of milk, and it is remarkable that no attempt should have been made to compare in this respect the average productiveness of good specimens of, say, Jerseys and Shorthorns. There are herd records of both breeds, it is true, but I have never seen any comparison of them upon an extensive scale.

The relative productiveness in meat or milk of any large and small breeds, however, is only part of the question upon which information is desirable. It would be useful to know whether, under given circumstances, a Hereford or a Dexter is the more profitable meat producer, and which would give the greater profit as a dairy cow—a Shorthorn or a Jersey. These are only typical examples of the comparisons which might be instituted. Others might be suggested, in which various large and small breeds, and middle-sized ones also, might be pitted against each other. It would suffice, however, for a beginning, to compare the profitableness of good examples of the large and small

breeds. To effect this object it would be necessary to ascertain the comparative consumption of food, and production in meat or milk, of good representatives of the large and small breeds of cattle.

In making these remarks I am not ignoring the differences in circumstances which render the keeping of one breed most advantageous in one district, and the preference for another breed reasonable in another part of the country. But there are circumstances in which local suitability does not enter as a factor in determining whether Shorthorns, Herefords, Polled Scots, Devons, Dexters, or Sussex cattle shall be kept for meat making; or whether Shorthorns, Ayrshires, Jerseys, Guernseys, or Kerries, shall be chosen for dairy animals. One farmer, in the course of his experience, has arrived at a certain conclusion in relation to two or more breeds, and another, after an equally fair trial, has come to precisely the opposite decision. Either may have had ample reasons for his judgment, or may have jumped to a conclusion upon evidence vitiated by accidents; but neither is likely to be able to adduce sufficient grounds for deciding the point at issue for other people.

There are marketing facilities which rightly influence the choice of breed in any particular district, as well as climatic or other characteristics; but the first of these considerations is dependent upon custom, which is subject to alteration in course of time. If it were shown upon a sufficiently extensive scale that where one breed is usually kept another would pay better, the fashion would gradually change, and marketing facilities with it. It is possible to eliminate all local considerations in a trial of the relative advantages of keeping different types of animals. English beef-makers, as a body, may regard with contempt the claim of the best of the small breeds to compete with their Hereford, Shorthorn, Devon, or Sussex cattle. They may be right, and yet they have not proved that they are so. There are English pastures upon which a Dexter would be as much at home as a Hereford, and it is not certain that the latter makes the better return in proportion to the food he consumes. Similarly, there are parts of England in which a Jersey or a Kerry flourishes as well as a Shorthorn or an Ayrshire, and might pay better for the cost of maintenance, for anything that has been shown publicly to the contrary. Such instances of uncertainty might be multiplied, but will suffice for my purpose, which is to plead for a competitive trial of typical breeds as a beginning of tests which can be pursued hereafter to a further extent.

Let me, then, come to business by suggesting that a couple

of trials should be made simultaneously by different associations —the more the better—under identical conditions.

The first trial would be arranged to determine which of two breeds would prove the more profitable in beef-making, and the two I would propose are Herefords and Dexters. The plan would be to have ten good representatives of each breed to feed from weaning time until they were three years old. But as it is not easy to tell how calves will turn out, and as some might die early, it would be advisable to start with fifteen calves of each breed, the best that good judges of each can select. At the end of the first six months any balance over ten in each lot could be taken out of the trial, the least promising being withdrawn. If one or two died afterwards, the loss would not materially affect the trial, as average results would supply the tests upon which a decision would rest. All the animals should have the same kinds of food, and as much as they could consume with advantage, all food, of course, being weighed, and the weights recorded. Unless health demanded a run on pasture in the summer, it would be best to keep the animals in yards when young, tying them up or putting them in boxes for the last few months of the trial. Both breeds being ordinarily grazing ones, a trial under such conditions would be no more unnatural to one than to the other, and it would be amenable to more exact conditions than if a run on pasture were allowed. But if it should be decided that a run would be desirable, the two lots should graze on different parts of the same pasture, care being taken to secure equality of grazing advantages, and the allowance to each of only a comparatively small division at a time, so that the difference of space fed off to the same degree of bareness could be ascertained. In this case the acreage of grass consumed, valued at the same rate for both breeds, would be charged against each. Roots and other food grown on the farm would, of course, be charged at fixed rates, and purchased food at cost price. The live weight of each animal should be taken and recorded at the end of every month, and the dead weight with all desirable details at the finish. The value of the carcass, loose fat, and offal would also be ascertained. It would then be possible to state the average expenses and returns for each lot, and to see which had proved the more profitable. Valuable information, too, would be obtained as to the difference in the consumption of food by good beef-making representatives of the large and small breeds of cattle.

One such trial would be of comparatively little value, as it could not be regarded as decisive. But if six, or still better, ten such trials were carried on simultaneously in different

districts under precisely the same rules, it is possible that very conclusive results might be attained. It is not certain that this would be the case, as the results of the several trials might be conflicting. On the other hand, they might all tell in the same direction, and so prove sufficiently conclusive. At the worst, they would afford a pretty close indication of the difference in food consumption of the two breeds.

The second experiment suggested is one to compare the food-consumption and milk-production of Shorthorn and Jersey cows. Ten three-year-old animals of each breed should be selected by competent judges, and fed under regulations similar to those prescribed for the first experiment. The cows should all be taken into the trial a week after calving, and kept for a year. All the milk of each lot should be weighed or measured daily, and all should be made into butter under the same conditions. At the end of the trial the quantities and cost of the food consumed by each lot, and the quantities and selling value of the products of each, should be published. Here, again, if the trial were carried on simultaneously and under identical conditions by six or more societies, valuable information would certainly be forthcoming, and it is possible that conclusive evidence as to the superiority in profitableness of one breed as compared with the other might be obtained. It would be well worth while to make these trials, if only for the sake of gaining approximate information as to the difference in the consumption of food by one of the best of small breeds and one of the best of large breeds of dairy cows.

After these two experiments had been concluded, others of like character with different breeds might be carried out. It is not desirable to particularize them now, because it is of the utmost importance to have a beginning agreed upon with certain breeds for each trial, in order that it might be carried out by several bodies or individuals under the same strict conditions.

It has been stated that no well-known and publicly-conducted examples of such trials as I have suggested have ever been made in this country. Nor am I aware of trials of precisely the same character having been made in any other country. In Germany, for many years past, experiments have been carried out in order to ascertain the average requirements, in food constituents, of animals of various live weights and in different stages of fattening, dairy cows, and lean stock of different ages. Such trials have been so systematically pursued that Dr. Wolff has felt justified in publishing precise statements of the quantities of the principal nourishing constituents of food required per day by such animals. Upon how many trials

these were based I cannot say; nor can I state the test conditions under which the trials were carried out. Many thousands of trials would be necessary to inspire confidence in such averages, and even then the conclusions would not necessarily be acceptable in respect of other than German breeds of live stock. The figures, I believe, have been altered more than once in accordance with the teachings of extended experience. To say the least, it is doubtful whether any number of trials would justify a precise statement of the average number of pounds of albuminoids, carbo-hydrates, fat, and total nutritive substances required daily by cattle of all sizes and qualities per thousand pounds of live-weight. The food requirements of animals vary so greatly that averages embracing the "scrub" beasts of the American prairies and the most perfected specimens of Bates or Booth Shorthorns, or the stunted and skinny half-bred Kerry of the Irish hills and the broad-backed Hereford of the Severn pastures, would be open to justifiable suspicion. Such trials are valuable as indicating approximately the proportions of albuminoids and carbo-hydrates most conducive to the advantageous feeding of animals for meat-making or milk-producing; but I doubt whether any statements of the quantities of food constituents required for animals of given live weights can be otherwise than misleading, unless confined to specified breeds and qualities.

To show how lacking the elements of calculation are in fixity, it is only necessary to ask what is meant by "food requirements." Requirements for what? In the case of fattening oxen, the requirements vary according to the pace of fattening. A beast fed gradually for the butcher would need less food than one forced for exhibition. It might be possible to ascertain the quantities of food constituents necessary to keep a particular animal of given live-weight in an attained state of fatness; and it might even be allowed that if such knowledge were obtained with respect to a thousand well-bred Shorthorns, for example, the averages of quantities would be acceptable approximations, as far as cattle of this particular class are concerned; but that averages of the same kind applicable to all breeds and qualities of fattening cattle would be trustworthy I cannot admit. It appears to me, therefore, that Dr. Wolff's figures, so far as they relate to quantities of food required by animals of given live-weight, are of no practical value as a guide to the producer of beef, and that they do not afford trustworthy evidence as to the proportionate consumption of cattle of the large and the small breeds.

One great advantage of the first set of trials suggested

is that it would throw a good deal of light upon a question of fully equal importance to the one named as the main issue to be tested. It appears to be now generally admitted that cattle made ready for the butcher at the age of two years or sooner pay better than those kept on until they are three years of age or older. At least, there is pretty conclusive evidence of this being the case when the animals are fed well from calf-hood. The records of daily gain, from birth, of cattle exhibited at the chief fat-stock shows of England and the United States prove that the gain is greater on the average with animals up to the age of two years than it is up to that of three years or more ; and as common experience shows that the consumption of food on the part of the older beasts is greater than that of the younger ones, the superior profitableness of the latter is sufficiently proved as far as cattle fed for exhibition are concerned. It does not necessarily follow that a beast fed well up to the end of its second year, and finished off then, pays better than one of equal quality kept cheaply until it is two years old, and then fattened up to the end of the third year. To test this point a separate set of trials would be necessary. Nor do show records afford a conclusive answer to the question whether it pays to keep cattle until they are three or four years of age. In most cases of beasts exhibited at one year's show when three years of age, and again at the next, the value of the increase in the live-weight is not sufficient to cover a reasonable estimate of the cost of feeding them during the interval ; and in many cases the same may be said of animals exhibited first as two-year-olds and again as three-year-olds. But in the absence of actual data as to the cost of feeding, the evidence is not conclusive. Besides, what is true of show beasts is not necessarily so of those fed in an ordinary way for the butcher.

A few years ago an American writer published the average results shown by the records of three "block tests" held at the Chicago Fat Stock Show, when the exhibitors were required to furnish details as to the food given to the animals. Although I cannot now lay my hand upon the article referred to, I distinctly remember that the conclusions arrived at were that beasts slaughtered at the age of two years or less paid better than those three years old, and that those kept till they were four years old did not pay at all. The evidence, however, was not sufficiently trustworthy, because there was no proof of the accuracy of the statements submitted by individual exhibitors. Here, too, the objection may be raised that the case of a show beast is not a fair criterion.

Now, a sufficient number of trials of the first class, suggested

above, would afford—unless they happened to be too conflicting—fairly conclusive evidence upon two of the points just mentioned. They would show the quantities and value of food consumed, and the live-weight and value of beef produced, by a considerable number of cattle, month by month, up to the age of three years. Supposing that there were ten trials, we should have records of the details in relation to a hundred well-bred Herefords, and an equal number of good Dexters; and, if the trials were all well conducted, the average results could hardly fail to inspire confidence. The results might possibly differ so greatly as to prove nothing; but, on the other hand, they might tally so closely as to be absolutely convincing. In the latter case we should know (1) whether, with certain feeding stuffs and beef at given prices, it paid to fatten cattle at all with those foods apart from the value of their manure; and (2) at what age, up to three years, after they were in any way fit for the butcher, they paid best or lost least. If the animals paid up to the age of three years, or if the loss was so small as obviously not to exceed the value of their manure, it might be necessary to have a fresh set of trials to ascertain whether cattle could be advantageously kept to an older age; or the same trials might be prolonged. In all probability, however, this would not be found necessary, and as it would be tiresome to have the issue of the test originally proposed left undetermined beyond the three years, the prolongation would not lightly be determined upon.

Of course no trials can settle in an absolute manner the question whether it pays feeders generally to fatten cattle up to a given age, because circumstances vary so greatly that what would be remunerative to one man would not be so to another. For example, one man may be able to grow roots or hay at twenty per cent. less cost per ton than another; while the variations in prices of purchased feeding-stuffs and beef render any general conclusion additionally difficult. But a sufficient number of trials might justify a confident expression of opinion to this extent—that, under the prescribed feeding conditions, and with the feeding stuffs used at given prices, well-bred animals of a certain breed, kept up to a particular age, will produce beef at a specified cost. Each farmer would then have to decide on his own account whether he could produce roots, hay, and other fodder at the prices named, and to calculate the differences in the expense of meat-making caused by any rise or fall in the prices of cattle foods which have to be purchased.

If it be objected that a conclusion so hedged about with varying conditions is not much to aim at, the answer is that nothing

as definite has ever yet been established, and that a more sweeping verdict would be untrustworthy. But it is to be borne in mind that the numerous variations which have to be considered in determining whether, as an absolute fact, beef-making pays at all, or up to a certain age and not beyond it, do not affect the merely comparative issues relating to large and small breeds or to ages for butchering cattle. The questions whether it is more advantageous to keep Herefords or Dexters for beef-making, or whether it is more profitable to kill either at the age of two years or at that of three years, are not affected by the rise or fall of markets for feeding-stuffs or beef.

In order to avoid complication, I have hitherto refrained from going into the question of the valuation of the manure that would be produced by the subjects of the two trials suggested. It would simplify matters to leave this point out of account in comparisons of breeds and ages, although it has an important bearing upon the decision as to whether beasts yield any profit or not; but to do this would be to give an undue advantage to small breeds and to animals finished off at a youthful age. It is obvious that the intrinsic value of the manure would be in inverse proportion to the advantageous conversion of food into beef or milk under given conditions. In other words, the greater the quantity of meat or milk produced from a given quantity of food, the less the value of the manure would be. Or, to put the point in yet another way, the greater the waste, the more valuable the manure. Again, the greater the quantity of food consumed, if there were any considerable difference, the more manure would there be. Therefore, the manure made by the large breed of cattle would be presumably more valuable than that produced by the small breed. There would be more of it, and it might also prove to be more valuable intrinsically. The same may be said of the manure produced by animals kept for three years or more, as compared with that made by animals killed at a younger age. It would hardly be worth while to go into the question of the intrinsic quality of the manure made by one lot of cattle as compared with that of the excrements of the other lot; but the quantities should be estimated and valued in proportion to the quantities of foods of various kinds consumed, and in accordance with well-known data concerning the proportions and values of excrements. It would be desirable to take into account the depreciated value of dung caused by the great reduction in the prices of artificial manures which has taken place in recent years; and, therefore, to insure uniformity of valuation, the several conductors of identical trials should agree

upon a certain percentage of deduction from the values given in the Rothamsted table of manurial values, or any similar table compiled some years ago.

As to the further question of whether cattle kept cheaply up to the age of two years, and then fed for the butcher until they were three years old or more, would pay as well as or better than those fed under the conditions of the first set of trials, it would, as already stated, have to be the subject of a separate test, if tried at all. It would be a difficult problem to settle by experiment, as the animals fed cheaply, and just kept growing, for two years, if managed under the most favourable conditions as to economy of feeding, would be so shifted about that the valuation of their keep would be, in the main, a mere estimate. It is doubtful whether the trial would be worth the trouble it would give, because the *crux* of the question at issue must always be mainly a circumstantial one. It would be absurd to tell a man who can run his cattle on free pasturage in America, or even one who has hundreds of acres of nearly free grazings in Ireland, that he would do better by fattening his cattle from birth than by letting them run and grow into money at a trifling expense. Such breeders are quite right in keeping their animals cheaply for a couple of years, whether they sell them as stores or ultimately fatten them. On the other hand, breeders who have no cheap grazing land hardly need convincing nowadays that their most profitable course is to make their animals grow and fatten at the same time. What it would be highly desirable to prove in this connection is whether it pays better, as a rule, to buy stores two years of age or more to fatten, or to breed or buy calves to fatten from the earliest age. But, seeing that two-year-old stores may be 50 per cent. dearer in one year than in another, it is not easy to say how this question can be decided otherwise than by the lengthened experience of feeders who have tried both systems, or by the collation of results obtained by a great number of the followers of each practice.

Turning to a different class of experiments, the further elucidation of the great Nitrogen Question at once presents itself as a highly desirable object. The important papers contributed to this Journal by Sir John Lawes and Dr. Gilbert, Dr. Munro, and Dr. Fream, and the numerous explanatory articles which the last named writer has published in agricultural papers, have made all careful readers of agricultural literature familiar with the recent discoveries of science in this connection. A theory long maintained by certain foreign

investigators has been tested and confirmed by the highest English authorities, and has been all the more readily accepted because it is entirely in accord with the results of ordinary farming experience. That leguminous plants not only flourished without being supplied by man with what we now distinguish as nitrogenous manure, but also in some way enriched the soil for the succeeding crop, is a fact which has been familiar to farmers ever since agriculture became a system ; but the reason has been only recently established beyond dispute.

It is not necessary on the present occasion to inquire whether the precise *modus operandi* has been also distinctly established—whether, for instance, the evidence as to the agency of root nodules or of the microbes associated with them will stand the test of time. It is enough for the present to know that, in some way, leguminous plants are enabled to derive all the nitrogen they require from the atmosphere. The further question as to whether certain foreign chemists are justified in their assertion that other plants than those belonging to the natural order Leguminosæ also assimilate the nitrogen of the air must be left to specialists to investigate. The assertion is said to be supported by the results of recent experiments carried out by a high authority in Germany ; but, apart from the fact that it is not in accordance with the apparent teachings of ordinary farming experience, its examination requires the elaborate and precise methods of the scientific expert, and cannot therefore be recommended as a subject for ordinary field trials. What I have now to propose is a set of co-operative trials by different agricultural associations for the purpose of ascertaining how the discovery in relation to leguminous crops can be best applied to farm practice.

In the first place farmers need to ascertain whether it will answer their purpose to modify their usual rotation of cropping, or their method of disposing of some of their crops, in order to levy a tax upon the practically boundless wealth of nitrogen in the atmosphere. At first sight there is something exceedingly attractive in the idea of free nitrogen, that element of fertility being at once the most essential and the most costly of all plant-foods. The question is, however, whether a sufficient supply of atmospheric nitrogen can be obtained free of expense; or, if it costs something, whether and in what way it can be obtained at less expense than is incurred under the present general methods of supplying nitrogen to land. Under an ordinary rotation of cropping a limited levy upon the nitrogen of the atmosphere is clearly made without expense, because the clover crop at least—to say nothing of other leguminous crops

—pays as well as almost any crop that is grown, and better than most other crops. But it is equally clear that the atmospheric contribution of nitrogen obtained in an ordinary cropping rotation is not sufficient, as all good farmers supply their land with this important element by purchasing feeding stuffs or manures containing it. It is certain, then, that ordinary farm practice must be modified in order to obtain all the nitrogen that is needed from the air. But the necessary modification might possibly involve such a diminution of returns from the sale of crops or stock, or both together, that the nominally free supply of atmospheric nitrogen would prove a very costly one. To put the case in familiar imagery, Nature offers us an unlimited quantity of nitrogen absolutely free in her atmospheric market, but does not pay carriage; and the freight, including service and terminal charges, is an unknown sum which may possibly exceed the value of the commodity.

The problem before us is one of considerable complexity, so numerous are the points to be decided before it can be fully solved. M. Ville, in his usual summary fashion, has cut the Gordian knot by recommending the ploughing-in of green crops, an old-world system to which he has given the new, fantastic, and misleading name of "Sideration." It is astonishing that he should assume as a self-evident fact that the nitrogen obtained at the cost of a year's rent and other expenses upon the area of crop ploughed in is obtained in the cheapest possible way, for the method would strike most practical farmers as probably the dearest. It may be the cheapest method in the long run, but it should be proved to be so before it is recommended for general adoption. M. Ville does give estimates of the cost and returns of his system, as compared with those of the old triennial rotation of two corn crops and a fallow; but estimates will not suffice in a case of such vast importance, and, even if it were demonstrated that his system was superior in all respects to the one with which he compares it, we should still be without evidence of its superiority to better systems than the old three-course one. Moreover, M. Ville, with no fear of clover-sickness before his eyes, recommends the growth of clover every third year, his rotation being one of clover, ploughed in, winter wheat, and oats or spring wheat. The clover is to be manured with superphosphate, chloride of potash, and gypsum, the atmosphere supplying the nitrogen; and the land thus manured is to be left to produce two white-straw crops without further manuring, as well it might be. The feeding of live-stock on the produce of arable land M. Ville deems a nuisance and an extravagance. When kept at all, he would have the

animals grazed on pasture liberally manured and devoted to them entirely, hay being eliminated as a farm crop. How cattle or sheep are to be fed in winter under such a system is not explained. As M. Ville estimates the cost of dung at 12*s.* to 14*s.* 6*d.* a ton, it is not surprising that he regards it as an exceedingly wasteful manure, and that he ridicules the idea of keeping livestock for the purpose of making it; but in this country we fancy we can produce it at a lower cost.

If by any plan of manuring clover-sickness could be prevented, the system of growing clover every third year would be a hopeful one, provided that it was fed on the farm, partly in a green state, and partly in the form of hay. It would be more plausible, however, to propose a variation of leguminous cropping, with a longer rotation than one of three years, and yet one so arranged that a leguminous crop would be grown every third year. In the Journal of December 31, 1891 (vol. ii., 3rd series, page 870), Dr. Fream gave some particulars concerning a system in regular, and apparently successful, use in Germany, under which leguminous crops in great variety are grown and ploughed in, supplying all the nitrogen that other crops require. No livestock are kept, and only non-nitrogenous manures are purchased. Unfortunately, the rotation pursued is not described in the article.[1]

In their article on "The Sources of Nitrogen in our Leguminous Crops," in the same number of the Journal, Sir John Lawes and Dr. Gilbert refer to some experiments now being made on two hundred acres of land by Mr. Mason, of Eynsham Hall, Oxfordshire, in order to test the practical application of recently acquired knowledge in regard to the fixation of nitrogen. Mr. Mason's plan, briefly stated, is to grow mixed leguminous crops, partly in place of roots, converting the produce in the first year into silage, and in the second year into hay; the assumption being that the land thus occupied for two years will be supplied with sufficient nitrogen from the atmosphere to allow of the subsequent growth of such crops as corn and potatoes, with the purchase of only non-nitrogenous manures. In brief, the plan is to grow first nitrogen-accumulating crops for consumption on the farm, and afterwards nitrogen-consuming crops for sale. This plan appears to me to point more hopefully than any other yet made known to the direction in which present rotations of cropping are likely to be modified, in accordance with the recently acquired information relating to nitrogen. Roots are very expensive crops to grow, and very ex-

[1] Because it is not described in the foreign memoir.—W. F.

hausting crops too, while the damage done to heavy land in carting off a root crop in a wet autumn is often a very serious item.

The foregoing remarks point distinctly to two desirable experiments which might be conducted separately or together. The first would be for the purpose of comparing the results of the ploughing-in of nitrogen-accumulating crops with those of feeding them on the land; and in the second the results of growing roots would be compared with those of growing nitrogen-accumulating crops. Although there would be a saving of expense in combining the two trials, for the sake of simplicity I will describe separately the proposed methods of conducting them.

For the first trial two leguminous crops would suffice, and those suggested are red clover and common vetches. Half of each crop would be ploughed in when in full blossom, and half would be fed on the land by sheep (which would have no other food), and then the land would be ploughed. In order to make the conditions equal, it might be arranged that only as much land as the sheep fed bare in a day should be ploughed each day on the division to be ploughed in; or, as less troublesome, half the latter might be ploughed at the commencement of the feeding, and half at the end of it. Without some such arrangement, it might be said that there would be an advantage in favour of the fed-on division, arising from the continued maturing of the crop upon it while feeding was in progress. To insure as complete a consumption of the vetches as possible, it would be necessary to cut them, and give them to the sheep in racks or through hurdles—a not uncommon practice; otherwise so large a proportion of the crop might be trodden down that the distinction between ploughing-in and feeding-on would be less marked than it should be. The expenses of this operation and of otherwise attending to the sheep would, of course, be charged. The increase in the live weight of the sheep would be taken and valued, and they would then have finished their part in the trial. The land would all lie fallow until the autumn, when it would be drilled with wheat for the second year's crop. In the third year barley or oats would be grown. No manure would be applied to either of the corn crops. The grain of each year's crop would be measured, weighed, and valued, and the straw would be weighed and valued. Then we should see whether the returns from grain and straw from the ploughed-in portion of each crop were greater or less than the returns from the meat, grain, and straw of the fed-on portion. The returns obtained from respectively ploughing-in and feeding-on clover might also be compared with those of vetches.

If this trial were carried out in exactly the same way at ten

stations simultaneously, care being taken to select a field of uniform soil and condition in each case, so as to avoid giving any advantage to either plan, it might settle the question as to the comparative advantages of ploughing-in and feeding-on nitrogen-accumulating crops.

It would not in any way affect the issue just mentioned if, at each station, a third piece of land in the same field were fallowed, and afterwards cropped in the same manner as the other two pieces. When scientific men talk of the waste of nitrogen incurred when land is fallowed, I strongly suspect that there is a "missing link" in the evidence taken into account by them. There is no doubt that a considerable quantity of nitrogen is lost in drainage water from a fallow; but a great deal more available nitrogen appears to be gained. Dr. Munro's valuable article on "The Nitrifying Ferments of the Soil," in the number of the Journal previously mentioned, shows that nitrification is promoted, while the destruction of nitrates is prevented, by the thorough aëration of the soil; that nitrates are destroyed much faster than they can be produced where there is abundance of organic matter without aëration; that nitrates are found in the greatest quantities in fallows; and that the great stock of nitrogen locked up in the soil is some hundred or thousand times as great as the quantity of nitrates. These statements tend towards the vindication of the system of summer fallowing which has of late been frequently aspersed. It is an expensive luxury at the best, and I do not contend that it is often to be recommended, or that it is likely to prove equal for the purpose of nitrogen-accumulation to the ploughing-in or feeding-on of leguminous crops; but still a trial, as above proposed, seems desirable. It may be said, perhaps, that summer fallowing is an exhaustive system in the long run, because, at the best, it only converts into available nitrates the inert nitrogen of the soil. But even if it does no more than this, is it not probable that, under an ordinary system of farming, there is a practically inexhaustible supply of organic matter in the soil for the production of nitrates? Certain it is that, on fairly good corn land, farmers are afraid of getting laid crops after a long fallow. This does not prove that fallowing does more than convert inert elements of fertility into an abundance or a superabundance of the available elements of plant nutrition; but it is strong evidence against the alleged loss of nitrogen, if a net loss be meant.

The information to be derived from the experiments above described would be much more exact than it otherwise would be if the soil of each plot were so far analysed at the beginning

and end of the three years as to show the gain or loss of nitrogen in each plot.

The trial of leguminous feeding crops *versus* roots would be less simple than that just described; but its great importance would justify almost any amount of trouble in carrying it out. In selecting the leguminous crops for this experiment, suitability for winter feeding must be one of the main considerations, as they would be grown as substitutes for root crops. Then, as clover has already a place in an ordinary rotation, and could not well, in the existing state of knowledge, be grown more frequently than it is grown, it should not be chosen as one of the crops to be tried against roots. It would be desirable to try as many of the other leguminous crops as possible if it were not for the objection to the complication of the trial; but, bearing in mind the force of that objection, I propose to take only two crops to try against mangels and swedes, and common winter vetches and lupins are the selections suggested. According to Dr. Fream, the white lupin is the variety found most advantageous in Germany, although the yellow lupin is more commonly grown at present. A few beans might be sown with the vetches to hold the crop up. Moderate dressings of manures, including nitrogen, to be prescribed by the Royal Agricultural Society's Chemist, would be used for the root crops, and non-nitrogenous manures for the leguminous crops; all being grown in the same field and on land as uniform in fertility as possible. One half of the vetches, lupins, and swedes would be fed on the land by sheep when the crops were severally mature, either without other food or with the same quantity of other food per sheep; the increase in live-weight being recorded and valued. The vetches, and possibly the lupins also, should be allowed to advance to the green-pod stage before being fed or cut, as vetches at least are not till then in the most valuable condition. After the feeding the land would be ploughed and left fallow until the autumn.

The second half of each of the leguminous crops would be made into silage, while the remaining half of the swedes and the whole of the mangels would be carted off the land. These respective products would be separately consumed in yards or sheds by different lots of cattle, evenly selected, and each receiving the same kinds and quantities per head of dry food; the increase in live weight of each lot being taken and valued when the product appropriated for it was finished. The same quantity of litter per acre of product to be consumed should be supplied to each lot of cattle, the manure made by each lot being carted back to the land from which the crop partly producing it was taken. However

badly the cattle consuming roots might need more than their fair share of litter per acre, they must not be allowed to have it. Expenses of all kinds would, of course, be charged to the piece of land in respect of which they were incurred. Two white-straw crops in succession would be grown on all the land without further manuring, and when the results for the third year had been recorded, the experiment would be finished. Although spring corn would come after roots in most rotations, it seems desirable to take wheat as the first white-straw crop, on account of its nitrogen-exhausting capacity. Barley may be suggested for the third year. At the end of the trial we should be able to compare the expenses and returns of the following divisions of forage crops and the two white-straw crops grown after each:—

1. Vetches 2. Lupins 3. Swedes	Fed on the land.
4. Mangels 5. Vetches 6. Lupins 7. Swedes	Fed away from the land, the manure being restored.

We should see whether either vetches or lupins, or both, had beaten swedes, financially, when all three were fed off on the land and followed by two white-straw crops; and whether either or both of the leguminous crops had beaten either or both of the root-crops in respect of cattle-feeding and corn-growing.

The value of this experiment, as of the one previously described, would be greatly enhanced if the soil of each plot were so far analysed at the beginning and end of the three-years period as to show the gain or loss of nitrogen in each plot.

In my opinion this is by far the most important of the experiments which I have suggested, and it appears to me highly desirable that special efforts should be made to induce a number of agricultural associations to carry it out under uniform arrangements. That it would be no slight undertaking must be admitted; but I do not know of anything that an association could do more likely to prove of service to farmers. In support of this plea Sir John Lawes and Dr. Gilbert may be quoted; for, although the details of the experiment have not been submitted to them, it is of a kind which they have recommended. In the article previously mentioned they say:—" Now, however, that the character of the action (the fixation of atmospheric nitrogen) is more clealy understood, and it is certain that there is actual gain of nitrogen from sources external to the soil

itself, it seems desirable that at any rate tentative trials should be made on different descriptions of soil, with the view of ascertaining whether more advantage cannot be taken of this source of nitrogen than our established practices of rotation at present secure."

County Councils might well be asked to contribute some of the money they have to spend upon technical education in assisting agricultural bodies to carry out the experiment, as it would possess more educational value than scores of the lectures upon which they are now spending large portions of the funds at their disposal. If, with such assistance or without it, the trial were made at ten stations, the results might possibly be so generally in one direction as to go far towards settling the main question at issue. I do not say that, under any circumstances, they would finally settle it, because there are at least two important points to consider in addition to the immediate profitableness of the rival crops. Supposing that the advantage of the three years' trial should rest with the leguminous crops, there would still be the question whether land could be kept clean if these crops were substituted for roots. Again, in very light soils the solidifying effect of a root crop fed on is valuable, and the question would arise whether the loss of this advantage would be compensated by any gain of nitrogen obtained by the substitution of leguminous crops for turnips. For my own part, I do not expect to see roots superseded on light soils, although it seems to me by no means improbable that the time will come when they will be but little grown on heavy land. As it is, the best policy of the heavy-land farmer seems to be that of forcing the greatest possible bulk of roots from the smallest area of land.

The question of keeping land clean reminds me of a point avoided in describing the proposed experiment. The vetches and lupins would be cleared off the land comparatively early in the summer, and, in order to obtain the greatest advantage from the new system, it might be considered necessary to grow a second crop, such as rape, mustard, or stubble turnips, to be fed off in time for wheat sowing. To include such catch-cropping in the experiment would confuse the issue. Still, supposing that the leguminous crops turned out more profitable than the roots, it might be held that the advantage in their favour would be still greater if a catch crop were taken after them. Probably it would be, as far as a three years' trial would show; but the cleansing effect of fallowing the land after the vetches and lupins were cleared off might prove more profitable than catch-cropping in the long run.

As it will be necessary to vary the leguminous crops if they are to be extensively grown for fodder, it is highly desirable to try as many as possible. Beans may be specially recommended, as they provide an immense amount of nutritious food if fed off in the green-pod stage by sheep, and probably they are equally valuable for cattle, although I have not seen the latter point tested. They also make valuable silage, I believe. Then, there are lucerne, trifolium, lathyrus, serradella, the kidney vetch (for light soils), and other crops which are of the nitrogen-accumulating order.

Other experiments calculated to elucidate the Nitrogen Question might be suggested, such as the inoculation of soils with the special microbes required by the several leguminous crops, and with the two microbes which, as shown in Dr. Munro's article, carry on the work of converting inert nitrogen into nitrates. But, for the present, enough experiments have been proposed for the co-operative trials which this article is written to advocate.

WILLIAM E. BEAR.

CONTAGIOUS FOOT-ROT IN SHEEP.

In the history of sheep-husbandry foot-rot has always been referred to as a scourge of the race, causing serious losses wherever it appears, and in some parts of the world the malady assumes a degree of malignancy which entitles it to be classed among the most virulent of animal plagues.

The different views which have been entertained as to the causes of the disease, its nature and contagious character, have apparently arisen out of a misconception of the fact that several diseases of the foot of the sheep have been described as foot-rot, most of them depending on primary injury to the hoof, leading to inflammation of the tissues within the horny covering.

Contagious foot-rot, in the first instance, invariably exhibits itself in the skin between the claws, whence it extends to the interior of the foot, and causes the shedding of the hoof from the pressure of the fungoid growths from the secreting membrane of the internal foot.

Disease beginning in the Hoof.

A remarkable instance of the first form of foot disease was met with some years ago in Somerset and Dorset, and the following illustrations will show the changes which had occurred.

Three distinct conditions of the horny covering of the foot were recognised. The disease commences in the hoof itself, as has been stated, the alteration of the internal structures taking place subsequently. One condition extremely marked is the decay of the horn at the toe, and the passage of particles of sand and dirt through the openings in the shrivelled hoof at the toe into the interior of the foot. See Fig. 1 (1).

Then a second condition is the overlapping of the lower edge of the wall of the hoof, illustrated in Fig. 1 (2), leading to the retention of grit and sand, which, owing to the pressure on

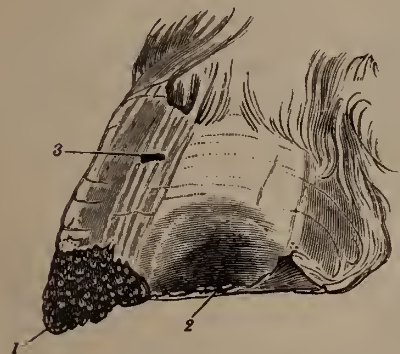

Fig. 1.—Foot of sheep showing disease of horn.

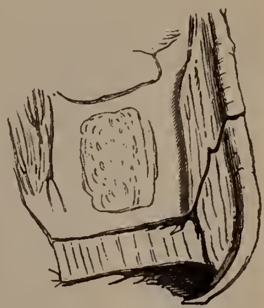

Fig. 2.—Section through the foot showing a crack extending through the wall.

the base of the foot in the ordinary course of movement, is driven through the spaces between the horn fibres into the interior of the horny cavity.

A third condition is the existence of a minute fissure in some part of the hoof, commonly at the outer surface of one of the digits, indicated on the white hoofs of the Dorset and Somerset sheep by a dark line, sometimes not more than the sixteenth, and rarely more than the eighth, of an inch in length, as shown in Fig. 1 (3). The consequence of these changes of structure is exactly the same in each case: the passage of gritty material into the interior of the horny box, either through the decayed horn at the toe, or through the sole under the overlapping wall of the foot, or through the small fissure in the wall of the hoof,

which is the entrance to a crack which passes into the foot, as shown in Fig. 2.

Inflammation and exudation, and, in short, the characteristic results of the inflammatory process naturally follow the introduction of gritty particles into the interior of the horny box. This form of foot-rot may be classed with the several diseases of the foot due to injury from the constituents of the soil, thorns, broken glass, nails, and generally to any agencies which interfere with the integrity of the structure of the hoof, and thus expose the internal tissue to injury. Neither of these affections is in any sense contagious, and all of them may for the present purpose be excluded from consideration as not coming within the definition of contagious foot-rot, which is the subject of this paper.

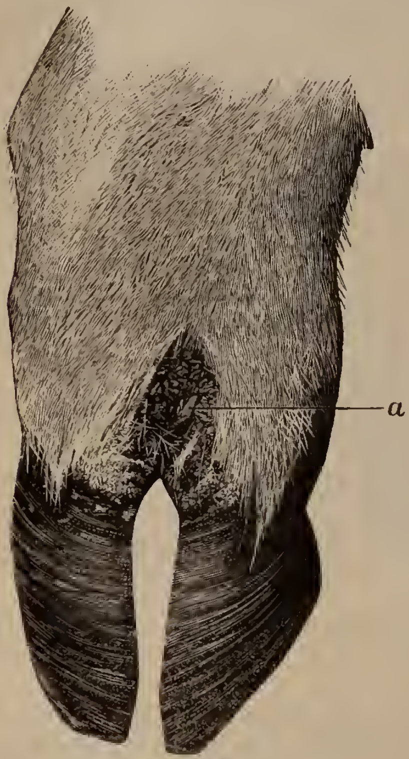

Fig. 3.—Foot of sheep showing early stage of disease affecting the skin between the claws.

Contagious Foot-rot.

At the outset, foot-rot can be distinguished from all forms of foot disease of the sheep with ease and certainty, and the practical man searching for signs of the affection looks at the skin between the hoofs, and seeing a little moisture or white discharge with very minute pimples covering the skin, is aware that the disease exists. In Fig. 3 this condition is shown as well as it is possible to indicate it by the aid of the pencil. Daily observation will prove that the disease of the skin sometimes advances rapidly and assumes a very marked character, the whole surface becoming covered with elongated warty growths, as seen in Fig. 4. In most instances the inflammation extends to the inner side of the internal structures of one claw, and the hoof becomes disconnected from its membrane, which is covered with

long fungoid growths, as they are called—in reality, horn fibres so rapidly produced that they are wanting in solidity. The

FIG. 4.—More advanced form of disease of skin between the claws.

whole product of the morbid state is, indeed, a mass of epithelial cells, as shown in Fig. 5. When the disease runs its course un-

checked, the horn of the diseased claw is loosened from the inner surface and in a short time is entirely thrown off, and a new hoof begins to grow from the coronet downwards. Fig 6. shows this change. If the hoof is not thrown off quickly, it grows with rapidity and is more or less distorted in form, as seen in Fig. 7. The horn tufts or fibres sprouting from the diseased membrane

FIG. 5.—Scraping from fungoid growths. *a, a,* Epithelial or horn cells, magnified 200 diam. *b, b,* Micro-organisms, magnified 1,000 diam.

are seen distinctly in Figs. 6 and 7 ; and in the next illustration (Fig. 8) a small portion of the diseased membrane has been hardened and cut into fine sections, one of which is shown, exhibiting very distinct horn structure.

In reference to the changes which are illustrated in the last three drawings, it may be remarked that similar changes are seen in other inflammatory diseases of the foot of the sheep, also in foul in the foot of the ox, and in canker in the foot of the horse. It is therefore necessary to lay stress on the state-

ment that the characteristic signs of contagious foot-rot are most perfectly defined in the earlier stages of the disease.

FIG. 6. Foot-rot in an advanced form; the secreting membrane is covered with fungoid growths.

EVIDENCE OF THE CONTAGIOUS CHARACTER OF FOOT-ROT.

Among the inquiries which have been undertaken to solve the disputed question of contagion, reference may be made to

three or four sets of experiments which have extended over a long series of years.

In 1867, at the instigation of the members of the Maidstone Farmers' Club, who sent cases of foot-rot to the Royal Veterinary College for the purpose, an investigation was carried on for twelve months, and the results were sufficiently definite to justify the conclusion that the disease can be produced by

FIG. 7.—Distortion of hoof in an advanced form of foot-rot.

contact with an infected animal, and also by the application of the discharge from a diseased foot to the skin between the digits. Inoculation of the discharges by puncturing the skin, and in other cases by removing a small portion of the hoof of a healthy foot and applying the matter to the exposed secreting surface, was generally followed by healing of the injured part; but some days afterwards the skin between the digits became moist and swollen, and the early stage of foot-rot was developed,

but did not advance beyond that stage, although no means were taken to check it.

Two years ago (1890) the question of the contagious nature of foot-rot was raised in a communication to the Society from

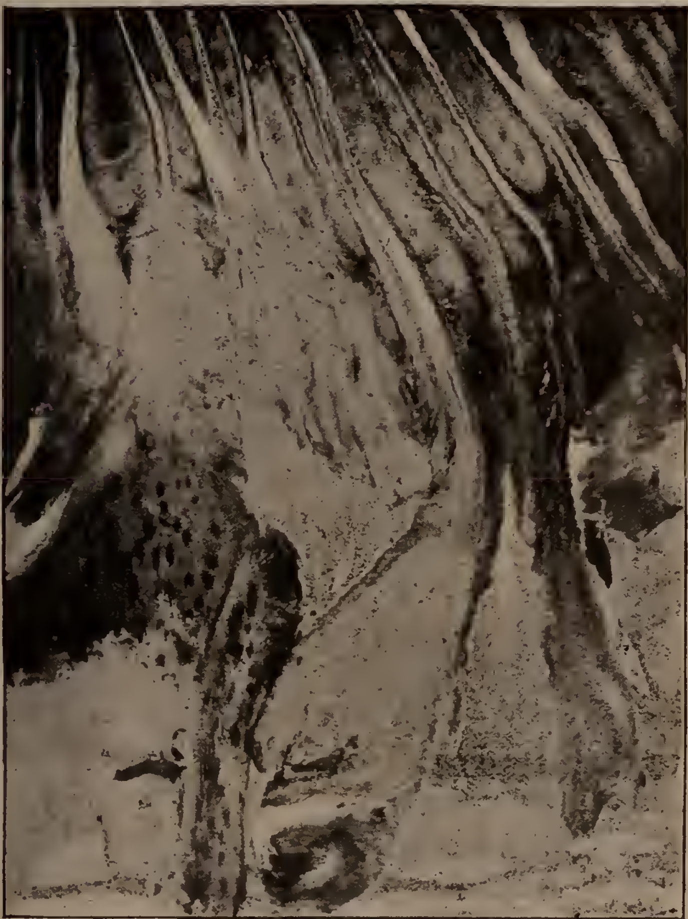

FIG. 8.—Section of fungoid growths, horn fibres.

Mr. Nott, of Tenbury,[1] who contended that the disease is only produced by means of contact with a diseased sheep, and that the only certain method of prevention is to avoid the introduction of fresh sheep on to a farm.

[1] See Journal, Vol. I. (3rd series), 1890, p. 733.

Mr. Nott sent two sheep to the Royal Veterinary College for the purpose of experiment in the beginning of April, 1890. The animals did not show any signs of foot-rot, indeed their feet were perfectly healthy, but from the circumstances of their history it was believed that the disease would appear if the sheep were placed under favourable conditions. Accordingly, they were placed on a pasture on a clay soil, and the want of rain was as far as possible compensated by constantly watering the ground. Two healthy sheep were put in the same pen with these sheep, and kept with them till the end of the third week in June without any result. All four sheep remained free from disease.

On November 11 of the same year a well-defined case of foot-rot was obtained and sent to the College, where it was put on grass with two perfectly healthy sheep. After about three weeks' exposure both the sheep became lame in one hind foot. The diseased sheep was much worse. Association of the animals was maintained until the middle of February, 1891, when the disease had practically ceased to exist. The diseased sheep and those in contact had recovered, and were perfectly sound. It is worthy of remark that during the whole time that this experiment was carried on the weather was generally dry.

In the early part of 1891 further experiments were conducted at Harrow and at Denham on a much larger scale than any which had been attempted previously. In the Harrow district the soil is stiff clay, and the difficulty was to find a pasture which had not become contaminated. At last an orchard was secured on which no sheep had been grazed certainly for many years past, and two diseased sheep from the neighbourhood of Maidstone, which were sent by Mr. C. Whitehead, were used for the experiment. Foot-rot in these animals was fully developed in a perfectly typical form.

In the pasture at Harrow three pens were constructed. In No. 1 pen in the first week in April were placed the two diseased Kentish ewes, one sound Welsh sheep, and three sound tegs; whilst in No. 2 pen were placed two half-bred tegs, and in No. 3 pen two Welsh ewes.

Owing to the absence of rain the experimental pasture was in a very dry condition until the last week of May. During this period the sheep's feet were frequently examined and nothing was found amiss with them, but rain having fallen for several days in succession towards the end of May the pasture became thoroughly soaked, and almost immediately afterwards signs of foot-rot were apparent.

On June 2 the Welsh ewe in No. 1 pen was noticed to be lame on its left front foot. On the following day it was caught

and the foot examined, when it was observed that the skin of the interdigital space was much inflamed, and that suppuration existed at the upper border of both claws at the interdigital space, whilst the leg immediately above the hoof was swollen and very hot. The left hind foot of this sheep was very hot, and on June 4 the disease had developed in this foot also.

On June 3 one of the tegs in pen No. 1 showed unmistakable symptoms of foot-rot in its right hind foot, but lameness was not marked until the next day ; on this date also another of the tegs became lame. The remaining teg in this pen did not become affected until two months later, namely on August 2, when the pasture was again very wet. Two of these experimentally affected sheep had the disease in three of their feet, whilst in one it appeared in one foot only. During all this period of time the four sheep which had meanwhile been kept in pens Nos. 2 and 3, under precisely similar conditions as the sheep in pen No. 1, except that they had not been in contact with affected animals, continued sound.

One of the Kent ewes and the Welsh ewe in pen No. 1 lambed in May, each having one lamb, sound and well nourished. On August 8 the Kentish lamb which remained from its birth in the pen had foot-rot in the off fore foot, and by August 16 all the feet were attacked.

On August 31 the sheep from pen No. 1 were placed on another pasture (seven acres); and on September 2 the two sound tegs from No. 2 pen, and a Welsh ewe from No. 3 pen (also sound), were put into *No. 1 pen*, from which the affected animals had been removed *two days previously*. On September 13 this Welsh ewe had foot-rot in both her front feet ; on September 19 one of the tegs had also become affected. On September 19 a Cotswold wether and a cross-bred lamb (both sound) were sent from Denham, and were placed in the seven-acre pasture with the eight sheep out of pen No. 1. On September 23 all the sheep were placed in this pasture with the exception of one Welsh ewe, which had never been removed from pen No. 3, and was still sound. On October 2 the remaining teg[1] became affected in her right hind foot. On October 9 the cross-bred lamb from Denham had foot-rot in her off hind foot, and on October 11 the Cotswold wether had the disease, and was very lame in his right fore foot; while on October 18 both of the Denham sheep had the disease in two of their feet.

Up to October 25 the Welsh ewe, which remained still

[1] *I.e.*, remaining teg from No. 2.

isolated in pen No. 3, was healthy, although the ground was extremely wet and the grass long; the Welsh lamb also continued healthy.

At the end of October the interest of the experiments was practically confined to the condition of the Welsh ewe, which had been isolated since the commencement of the work, and to the two sheep from Denham. The Welsh ewe had been removed on October 4 to pen No. 2. This was a healthy pen, lying very low. By October 25 it was a "quagmire." On November 8 this sheep had sores at the interdigital spaces of all four feet, due to irritation by foreign matter (mud, hay-bents, &c.), and was particularly lame on the right fore foot, but not from foot-rot. On November 14 it had still sores on all four feet, and there was loss of hair on the coronets, heels, and legs as high up as the mud extended; the interdigital spaces of all four feet still presented sores. This condition might be described as "foul in the foot" or "mud fever." The sheep was turned into the seven-acre field with the other sheep on November 14. It did not up to the date of its slaughter on February 9 develop foot-rot.

On November 8 the wether from Denham had foot-rot very badly in the left hind foot; the solar horn of both claws of this foot was "separated," and there was suppuration at the interdigital space. The right hind foot was nearly well. But the disease existed slightly in both front feet.

On November 8 the Denham lamb had foot-rot very badly in the left hind foot. The right hind foot was better. It had also foot-rot slightly in the right front foot.

The Kentish lamb, which had suffered terribly from the disease, having had it in all four feet, had new claws growing down from the coronet of the outside digit of three of its feet.

On November 14 both Denham sheep were greatly improved; all the sheep were then in the seven-acre pasture, and improved in condition for about a month, some of them getting quite fat; but on December 20 several of them again were extremely lame. This lameness appeared in a great measure to be due to the hardness of the ground, which was frozen, and to the overgrown and deformed condition of the feet. On January 11 (1892) the Denham lamb, which was very lame and lay about a good deal, was killed, and the feet retained as specimens. No sign of foot-rot was found on examination. On January 26 the feet of the speckled-faced teg and of the Kentish lamb were found to be deformed, but were free from foot-rot.

On February 9 the remaining sheep were killed. All were free from foot-rot.

A fourth series of experiments was carried on at the same

time at Denham, where an outbreak of foot-rot in the flock afforded a most convenient opportunity for an investigation.

July 23.—Five Cotswold tegs and five half-bred lambs were obtained from a hill farm at Cirencester (where, during the last seventeen years, there had never been a case of foot-rot, and prior to that, so far as could be ascertained, foot-rot had never been known on the farm). These sheep were arranged as follows :—

Pen A, in a barn on concrete floor.—One sound teg with one Southdown ewe with foot-rot.

Pen B, same as above.—One sound lamb with one diseased lamb (foot-rot). These concrete floors were swept out clean every morning during the experiment. The pens were eight feet by seven feet six inches.

In orchard, running loose. (The orchard is a dry and well-drained meadow.)—One sound teg and one sound lamb with one diseased ewe and one diseased lamb.

On grazing meadow.—At first penned by side of stream, and afterwards with range of whole meadow. (This is a very damp low-lying meadow almost surrounded by water, where sheep are never kept.) Three sound tegs and three sound lambs were placed to be left for a considerable time to test the action of damp soil and long coarse grass on the feet.

August 3, 1891.—All the above were examined. The sound sheep remained sound, and the diseased sheep were still diseased, although a little better.

September 12.—Second examination, with result as follows :—

Pen A, in barn.—Sound teg still sound; diseased ewe very bad in all four feet.

Pen B, in ditto.—Sound lamb still sound; diseased lamb nearly well.

Orchard.—Sound sheep and lamb still sound; diseased ditto much better.

Note.—On September 17 one teg and one lamb, both quite sound, from grazing meadow, were sent to Harrow and put on the pasture with diseased sheep, and both of them became affected; on October 9 the lamb, and on October 10 the teg, the lamb in the off hind foot, the teg in the off fore foot.

October 6.—Third examination :—

Pen A.—The sound teg had developed the disease in all four feet, as the result of being in contact with the Southdown ewe with foot-rot since June 25 on a hard floor which was kept as clean as possible.

A similar result occurred in *Pen B*, in which the sound

lamb had developed the disease in the off fore foot, the diseased lamb still remaining diseased.

In the *Orchard* the sound teg had developed the early stage of foot-rot in the off fore foot and both hind feet, the sound lamb showing disease very slightly in the off hind foot. Diseased ewe and lamb much better.

October 10, *Pens A and B.*—Disease becoming more developed in teg and lamb formerly sound; the ewe and lamb originally diseased are recovering.

Sheep and lambs on grazing meadow.—These were thoroughly examined on this day, and their feet were found in perfect order notwithstanding the long exposure to wet ground, long grass, and exceptionally wet weather.

October 12.—Two lambs from Pen B were sent to the Veterinary College, and the diseased ewe in Pen A was ordered to be killed and the feet sent to the College. The teg which had contracted the disease to be put in fresh pen (C), where no sheep had been before, with one sound teg and one sound lamb from grazing meadow. Floor to be kept thoroughly cleansed.

October 24, *Pen C.*—Teg and lamb free from any sign of disease, except that the lamb's feet were warm. Diseased teg remained in the same condition as when put into the pen.

November 5, *Orchard.*—Cotswold teg in orchard killed, feet sent to College; perfectly sound.

November 7, *Pen C.*—Diseased teg better, removed to another pen. Teg and lamb from grazing meadow still sound. Sound teg and lamb left in Pen C, to observe if disease would appear from contact with the diseased teg, from October 12 to November 7.

November 12, *Orchard.*—Cross-bred lamb killed. Feet sent to College, quite recovered.

November 19, *Orchard.*—Southdown lamb killed. Feet sent to College; found to be free from disease.

November 27, *Orchard.*—Southdown ewe killed. Feet sent to College; found to be free from disease.

November 28, *Pen C.*—Teg showed redness and swelling on inside digit of the off hind foot. Lamb had the off hind hoof ragged at the toe.

December 4, *Grazing meadow.*—The teg still remained sound; killed, and the feet sent to the College. No sign of disease after exposure to wet soil since June.

December 21.—Four sheep now remained at Denham, two tegs and two lambs from Cirencester (Cotswolds). One teg with foot-rot left in a pen by itself. A teg and lamb remained in Pen C.

January 2, 1892, *Pen C, teg and lamb.*—Teg remained free from disease. Lamb, off fore hoof ragged at bottom; off hind foot, horny growth above digits; slight evidence of foot-rot. Diseased teg in pen by itself had the off hind hoof still bad; off fore foot, rotten sole; near fore foot better. Little paddock, the lamb (from grazing meadow) had the hoofs a little cracked at bottom, no sign of foot-rot.

April 2, *Pen A.*—Foot perfectly recovered. April 26, killed; sound.

Pen C.—Teg and lamb quite sound.

April 22.—Both killed, feet sound. Lamb from grazing meadow now on cricket ground, where foot-rot prevailed last summer, sound yet.

May 25.—This animal had been running with several sheep affected with chronic foot-rot since last summer, but did not yet show any signs of disease.

From these and other experiments the following conclusions may be drawn:—

(1) So far as the evidence goes it justifies the statement that foot-rot is a contagious disease; the infective matter being active when brought in contact with the skin between the claws, or when introduced into the system by inoculation, and probably when taken in by the mouth from contaminated pastures.

(2) That it cannot be produced by long-continued exposuro to undrained moist soils with an abundant coarse and wet herbage.

(3) That animals exposed to these conditions for many months, and resisting entirely the influences named above, contract foot-rot in from fourteen to twenty-one days on being placed among sheep suffering from the disease.

(4) Sheep affected with foot-rot may improve, and from time to time become worse; and finally may recover and present a perfectly healthy condition of foot, notwithstanding that they have been kept the whole period under the conditions which induced the disease.

(5) That the contagium of foot-rot remains for some time in the system (ten to twenty days and longer) without any indication of disease appearing in the skin between the claws. An infected sheep may therefore escape detection even by an expert, and may introduce foot-rot into a sound flock.

Lastly, the question arises as to the possibility of sheep contracting foot-rot by taking the infective matter into the system during feeding on an infected pasture. It must, of course, happen in a pasture on which sheep affected with foot-rot are

grazing that a very large amount of infective material is distributed, and consequently taken up by all the animals feeding on the meadow; but it is not certain whether the disease can be so communicated.

Further experiments will have to be carried into effect in order to determine the point. It will be necessary to place sheep on a pasture which had recently been fed off by sheep with diseased feet, and to protect the feet of the experimental sheep by some means so as to prevent contact with the virus.

Cure and Prevention of Foot-rot.

One important fact has stood prominently forward in the history of the experiments—*i.e.*, the spontaneous recovery from even the most advanced stages of foot-rot without any trimming of the hoof, the use of any remedial measures, or the removal of the diseased animals from the places where they were kept during the progress of the disease. Accepting the teachings of inquiry so far as the evidence at present extends, it may be said that Contagious Foot-rot has a period of incubation, followed by the development of a diseased condition of the skin, followed by the extension of disease to the secreting membrane of the internal foot, ending in loss of the hoof, and a new growth of horn when the virulence of the malady is exhausted. In order that the course of the disease may be checked, timely detection is essential, and when foot-rot appears in a flock every sheep should be examined daily if possible, or at least three times a week, and a dressing applied the moment that any moisture is seen between the claws. A mixture of one part of pure carbolic acid with ten parts of glycerin is a very useful application, a little of which may be *poured* from a narrow-mouth bottle on to the skin and allowed to run between the claws.

Trimming the diseased feet is an operation which should be done with care; as a rule, the shepherd slashes the hoof horn away with his knife in a manner which may be described as brutal. In the advanced stages of the disease all the loose horn may be removed, and the club-like growths beneath it should be dressed with strong caustic—*i.e.*, pure carbolic acid, chloride of zinc, or perchloride of iron—and the parts protected by a coating of tar. But in a properly managed flock the disease should not be allowed to reach a stage at which such severe measures are necessary.

An easy method of dealing with foot-rot in a large flock without the work of daily examination of the feet is to drive

the sheep twice a week over a dry floor which is covered with powdered lime, or through a trough containing a solution of one part of carbolic acid with fifty parts of water in which a little soft soap is dissolved. Sufficient fluid should be kept in the trough to insure that the feet are completely covered.

Prevention can only be secured by avoiding the introduction of diseased sheep on to the farm, and also the prevention of contact between healthy and diseased sheep, and with contaminated ground;—a system which, if carried into effect, would entirely alter the customs of the sheep trade, as every farmer would be compelled to make his flock self-sustaining, and under no circumstances could he introduce on to his farm sheep from a fair or market, nor indeed from any source, until he had assured himself that they were quite above suspicion.

G. T. Brown.

VARIATIONS OF THE FOUR-COURSE SYSTEM.

The "four-course system," or Norfolk rotation, embracing the familiar succession of Turnips, Barley, Clover, Wheat, has been subjected to a long and exhaustive trial by the cultivators of this country. It has been advocated by enthusiastic supporters, deprecated by others whose soil and climate were unsuited to its practice, and, most important of all, it has been judiciously modified by yet a third class of cultivators, who, whilst not accepting it as a final resort, saw in it much that was useful and commendable. No subject has afforded a more fertile theme for discussion by those whose business it is to till the soil, and so recently as the early months of the present year it furnished the material for a two nights' debate upon a paper, "The Four-course System, with desirable Variations," read by Mr. E. H. Morris before the Surveyors' Institution. The essential part which the turnip crop has taken in the practice of the four-course system leads me to devote a few preliminary remarks to it.

It appears that the turnip plant was known to the ancients, for Columella frequently recommends the cultivation of *rapa* as food for both man and beast. The cultivation of the root in England is first recorded about the year 1645. Writing in 1686, Ray says turnips were sown for the growth of their roots

for the feeding of kine in England and foreign countries. The cultivation of the plant probably originated on the light sandy soils of Norfolk, though it made little progress until about the year 1730. Edward Lisle, a Hampshire landowner and agricultural improver, whose observations on husbandry were published by his son in 1755, mentions Mr. Pawlet, of Leicestershire, as growing great quantities of turnips as early as 1690. They were cultivated by Mr. Lisle at Crux Easton, in Hampshire, by Mr. Cooper in Berkshire, and by Mr. Cheslin, a large landowner, near Longhborough; thus showing that the turnip had become widely distributed before the end of the seventeenth century. Viscount Townshend, of Norfolk, and Captain Pringle, of Coldstream-on-Tweed, share the honour of having been the first to introduce turnip husbandry to the British farmer, though, from a practical point of view, opinion is strongly in favour of Jethro Tull, a Berkshire farmer, and of Dawson, the son of a Scotch farmer, near Kelso, on Tweedside. To Tull is due the conception and practical origin of drill husbandry, whilst Dawson, imbued like most of his countrymen with a spirit of enterprise, was the first to carry Tull's theory into practice by yoking two horses abreast, and forming the land into ridges where the dung was spread, and covered by reversing the operation. Dawson, however, shared the fate of many other pioneers, for his efforts proved a complete failure owing to the unsuitable character of the land on his father's farm. Possessed of the necessary means, and of energy and perseverance to carry out his design, he subsequently obtained possession of the farm of Frogden, at the base of the Cheviot Hills, the sharp undulating soil of which was admirably adapted to the growth of roots. Here the experiment succeeded beyond the most sanguine expectations, and this was the first introduction of two-horse ploughing without a driver. The ridging of the turnip crop by ploughs thus equipped led to the winter feeding of cattle and sheep, and gradually brought about improvements till then unprecedented in the history of agriculture. The field is still pointed out where Dawson, with the reins in his hands behind the plough, and his pair of horses, drew the first successful turnip ridge.

In far-off times the only rotation practised appears to have been that known as the out- and in-field system; when one field became exhausted by repeated cropping it was left to Nature to recuperate, whilst another was undergoing a course of cropping. In times when tenants were bound down by leases and stringent agreements a definite rotation of crops was specified. I can look back to the days of my pupilage when part of my

time was spent in filling-in cropping schedules to be attached to leases. Every field on the farm was numbered and named, and the crop for each year during the whole period of a nineteen years' lease was entered in tabular form. Compliance with the schedule was provided under the usual pains and penalties, and could not be deviated from except by a written authority from the agent.

Marvellous progress has, however, been made during the last forty years, within which period the practical man has acquired a better knowledge of the raw material to which his energies are directed. An acquaintance with the mechanical nature and chemical properties of the soil enables the intelligent cultivator to successfully stimulate and bring into profitable activity its latent capabilities. Soils may for our purpose be fairly grouped under five separate heads:—

1. Sandy soils, containing 75 per cent. and upwards of siliceous matter. Some of these soils, though originally barren, have been reclaimed from sterility—often, it must be admitted, at great cost—by the application of clay and by other means, and by the extended growth of forage crops. These crops were at the outset ploughed in with the object of increasing the humus in the soil, and subsequently trefoil, mustard, rape, and other succulent crops were eaten on the land by sheep; by such means the soil was consolidated and improved. Many of the sandy soils are now capable, under skilful management, of producing good crops of roots and spring corn, and these soils have long been cultivated under the four-course system.

2. Soils rich in vegetable matter, or humus, containing more than 10 per cent. of organic matter. Soils of this class were originally for the most part water-logged, and were frequently clothed with rushes and sedges. Where such soils contain 15 or 20 per cent. of clay, thorough drainage and subsequent appropriate treatment will convert them into productive tillage land or good permanent pasture, as may be desired. On such soils the potato crop luxuriates, and formerly the soils of this class were worked on the four-course system.

3. Marl soils, containing about 10 per cent. of carbonate of lime and 20 per cent. of clay. Many of the Chalk soils and the friable soils of other limestone formations belong to this class. Under skilful management these soils seldom fail to produce good crops, and are known as healthy stock breeding and feeding land.

4. Loamy soils, containing from 40 to 70 per cent. of clay. These constitute the most valuable class of soils in the country.

In favourable situations they rarely fail to yield heavy crops both of roots and of cereals.

5. Clayey soils, containing upwards of 70 per cent. of clay. These soils have been much improved by draining, though in many cases not to the extent which a large expenditure would have justified us in anticipating. Many of the leading drainers of forty or fifty years ago were led astray by the erroneous idea that, even on the strongest clays, depth was equivalent to distance apart. Much of the deep draining on this class of soils has proved inadequate. Nevertheless, where the work was well done the land has immensely improved, and even the tillage land has assumed new characteristics.

Where a good system of cultivation has been carried out, the land suitably manured at stated intervals, and worked in a moderately dry state, the strongest soils have given way to the ameliorating agencies, frost and water, and have become more friable and more easily moved. In former years the four-course system was undoubtedly the means of improving agriculture over a large extent of the British Isles. The discovery and use of guano and of other artificial fertilisers gave an impetus to the cultivation of roots, the extended production of which necessitated on all farms an increased head of stock in order to consume them, and as a result a greater quantity of manure was made. The use of cereals for fattening became general, and was subsequently supplemented by linseed and other cake, as a result of which the land and crops began to show a marked improvement. The fame of the four-course system was wafted to distant lands, and it frequently gained a footing on strong adhesive clays. So arbitrary and uncompromising a system was, however, in advance of the general knowledge of the tillers of the soil, and hence arose disappointments. It was found that the adhesive clays could not, in dry climates, be reduced to a sufficiently fine tilth in time to receive the seed. Even if the seeds did vegetate their progress was slow, and the young crop readily fell a prey to the turnip fly or other pests. In favourable seasons, when the crop escaped these disasters, if a showery autumn set in the roots could in no case be fed off on the ground, whilst the land was much poached and injured by hauling off.

The four-course system, with its unvarying cropping, had long since begun to tell unfavourably on the produce of the soil. A quarter of a century ago, on the best-managed farms cultivated under this system, twenty to twenty-five loads of farmyard manure was considered the regulation dressing for the turnip crop. This manure was for the most part made in open yards

surrounded by unspouted buildings, and, although the manure from the feeding-sheds was enriched to some extent by the residue of the artificial feeding-stuffs used for the fattening cattle, the store cattle in the yards were generally wintered on roots and long straw. This circumstance will enable the reader to draw his own deductions as to the value of the manure. A common custom on light or medium land was to draw off one-third of the crop for consumption in the yards, while the remaining two-thirds were eaten on the land by sheep. The fattening sheep consisted of draft ewes and shearling wethers, to which, in addition to the turnips, $\frac{1}{2}$ to $\frac{3}{4}$ lb. of corn or cake was allowed per head per diem, besides a foddering of hay or straw. The lambs or store tegs had no allowance beyond the turnips. The soil if closely folded was benefited by the treading, a single dressing of farmyard manure, such as it was, and the manurial residue left by the sheep, being deemed sufficient to furnish the food necessary to supply the wants of all the crops of the rotation.

Barley followed roots. That part of the turnip break fed off before the middle of February, if skilfully treated and the seeding completed before the end of February, insured on most barley soils a full average crop. Root land which has been folded and is intended for barley should have two clean earths. The plough should closely follow the fold, the second plough should immediately precede seeding, and the land should then be reduced to a fine tilth. Barley thrives best on a newly-turned furrow, and the substitution of the grubber and scuffler for the plough has injuriously affected both the quality and yield of barley. On the best soils, under the four-course system, late sowing is inevitable on a certain proportion of the break, hence the inferior quality of the barley. On some farms barley sowing is continued to the end of April. In moderately early seasons climatic influences hasten rapid growth, hence we get a weak straw liable to lodge with the first heavy shower; under any circumstances the grain is not of that plump bright colour so dear to the pale-ale brewer.

Another disadvantage of late sowing is the injurious effect produced on the young seeds by the weak-strawed early-lodged crops. Till within the last decade, when the use of well-selected artificial manures has become more general, there had been a general falling-off both in the yield and qualities of the barleys grown where the four-course system was strictly adhered to. The finest qualities were grown on the stronger land after a wheat crop.

The root crop where well grown has always been the most

expensive to cultivate of the whole course, and seldom proves profitable to the cultivator.

The nutritive value of the turnip crop varies considerably. Taking an average sample, one ton of swedes will not produce more than one imperial stone (of 14 lb.) of beef or mutton. The cost of production under the four-course system where farm-yard manure alone is used would be at least 8*l.* per acre, or 8*s.* per ton. Thus the meat, without the additional cost of labour, cannot be produced for less than 7*d.* per lb.

The crop is not only the most costly to cultivate, it is also the most exhaustive of certain manurial constituents of any in the rotation. Formerly roots were fed in excessive quantities, and were usually given whole to cattle; this entailed a considerable amount of exertion and expenditure of vital force. These roots, containing 90 per cent. of water, threw into the system a large volume of fluid at a low temperature, which could only be raised to the normal heat of the body by a considerable oxidation of carbo-hydrates.

On light lands, that had long been worked on the four-course system, it was well-nigh impossible with our knowledge of the subject a quarter of a century ago to grow a crop of broad clover. This was chiefly due to the repeated and exhaustive effects of the root crops, more particularly where the root crop was drawn off. Light lands began to show the injurious results at an earlier period, and in a more pronounced form, than the stronger and better class of loams. The cultivated grasses grown under this system were chiefly confined to the different varieties of rye-grass, cocksfoot, and others natural to the soil, but all the members of the clover family were erratic and uncertain. In some cases the seeds were mown early and grazed during the latter part of the summer; this, next to folding, was the best method of management. It prevented the formation of seed culms and the production of seed, an exhaustive process where the plant was thin and weak and closely grazed during the summer months. Considerable loss was entailed on the seed layers owing to the necessity of having to break them up in September. In the case of the wheat crop on the sandy soils the great difficulty was in getting the young plant to stand. It generally thinned off during the spring months, and early ploughing and drilling on a stale furrow were the best preventatives.

At one time autumn cultivation was much practised on light lands. When the soil was left throughout the winter without a covering of vegetation, the land suffered in condition from exposure to the winter rains. Where the weeds were destroyed,

and the land was seeded with mustard or other inexhaustive plants, these afforded some protection to the soil, and the land generally worked more mellow and kindly in the spring.

The four-course system was always an expensive one. The land was kept clean, and on the best soils fair crops were grown. But, as we have already hinted, enthusiasts were carried away by the idea that it was applicable to all soils, and hence failure and disappointment frequently resulted.

On most soils the four-course system has given place to a more extended and less costly rotation. Stock breeding and feeding, and the production of milk, are the aim of every practical man. A few years ago the cry went forth that we must lay the land down to grass, give up cultivation, and reduce the working expenses. This advice was followed for a time, and the labour bill, it is true, was reduced, but the returns were simultaneously reduced in a greater degree. The successful laying down land to permanent pasture is an expensive operation, and one not to be extensively undertaken by a yearly tenant. The intelligent cultivator was not slow to grasp the situation, and decided accordingly.

Restrictive covenants as to cropping must, in the first place, be removed. The chief condition now requisite is to keep the land clean and to grow good crops, but a quitting tenant, whatever his course of cropping may have been, must leave the usual proportion of fallows and seeds. Most farmers are now convinced that the best means of meeting outside competition is to make the farm as far as practicable self-supporting, both as regards stock and forage. This cannot be done by laying the land down to permanent pasture. Farmers have long known that the heaviest stocks can be kept on mixed occupations; hence purely grass farms, unless of the very finest quality, are already at a discount. Old tillage lands can be recuperated by an extended course when allowed to remain in grass for a period of two or three years, and grazed with sheep or cattle receiving a small allowance of cake or other artificial foods. By such means the manurial condition of the land is steadily improved, and meantime a large accumulation of vegetable matter will have been stored up in the soil for the use of future crops.

Let us compare the cropping of 100 acres of average light land cultivated on the four-course system and on the six-course system respectively, and note the difference. Under the former we get 50 acres of white-straw crops, 25 acres of roots, and 25 acres of seeds. Under the latter we take oats after two years' ley, followed by wheat, roots, and then barley or oats. Here we practically get the same acreage of cereals, but reduce

the root break, which is at once the most expensive and the least remunerative to the farmer. A reduction of 8 acres in the root break would show a considerable saving in the labour bill. The extra 17 acres of seeds would carry six to eight sheep an acre from April to October, provided they have an allowance of ½ lb. per head per day of cake or corn, three-fourths of which would be chargeable to the stock and one-fourth to the land. This is not only the cheapest but the best means of any with which I am acquainted for increasing the fertility of the soil. The second seeds, not being broken up for oats before February, would winter three or four sheep per acre from October to February. On a cattle breeding and dairy farm the second seeds make a valuable pasture, either for the milking cows or the young stock.

Another important consideration is the labour bill. Here, in Derbyshire, the wages of the agricultural labourer have risen 40 or 50 per cent. during a period of little over twenty years. It is not altogether, however, a question of wages, for the difficulty of obtaining men is yearly increasing. Whatever tends to reduce the cost of production benefits the tenant.

Although the cost of manual labour has increased, as we have stated, horse-keep has been less expensive; hence the cost of a plough—that is, a man and pair of horses—and the incidental tradesmen's bills, remain practically stationary, 100 guineas a year having long been a standard estimate. Basing our calculations on the character of the land we have under consideration, cultivated on the four-course system, 50 acres of tillage and 15 acres of grass would be as much as the man and pair of horses could successfully undertake. Extend the rotation to a six-course, and we get three white-straw crops instead of two. By reducing the root area and increasing that under grass we effect an economy of about one-fourth the cost of a plough on every 50 acres of tillage land.

We will pursue the calculation a step further. Under the four-course system we get:—

$$\left.\begin{array}{l}\text{25 acres of wheat, at 4 qrs. per acre} = \text{100 qrs.}\\ \text{25 ,, barley ,, 5 ,, ,,} = \text{125 ,,}\end{array}\right\} = \text{225 qrs.}$$

Turn to the six-course rotation, and we have:—

$$\left.\begin{array}{l}\text{17 acres of oats, at 6 qrs. per acre} = \text{102 qrs.}\\ \text{17 ,, wheat ,, 4 ,, ,,} = \text{68 ,,}\\ \text{17 ,, barley ,, 5 ,, ,,} = \text{85 ,,}\end{array}\right\} = \text{255 qrs.}$$

In this way we obtain 30 qrs. more corn, and although we lose 8 acres of roots, these really do not prejudicially affect the balance-sheet. The second year's seed crop provides us with

the extra keep of 130 sheep during the summer six months and of 60 sheep during the winter four months.

The steps recently taken by the United States as to the restrictions in the importation of breeding animals into that country will no doubt be keenly felt by breeders on this side. The stagnation of trade will, however, only be of a temporary character, and will subsequently benefit the home producer, and will in the end be beneficial to all classes. Home breeders will now turn their attention to supplying the home demand, the outcome of which is a growing tendency to produce quality rather than quantity. Provide the working man with regular employment and a fair rate of wages, and he will be our best customer. The demand is for small joints, the produce of young rather than of old animals. The competition from which the British farmer has been suffering is in the second-class and inferior qualities, which come into more direct conflict with imported meats.

The English farmer is now adapting his practice to the ever-changing circumstances by combining the dairy with the business of the breeder and feeder. With the aid of cheap artificial fertilisers and feeding stuffs, and of a well-devised system of alternate husbandry, and by the growth of catch crops, he can win from the soil the maximum of produce at the minimum of cost. The light siliceous soils, or blowing sands, were never adapted to the growth of wheat, although they are capable under skilful management of producing a considerable quantity of stock food. They are poor in vegetable matter, and may be improved by the growth of mustard or other succulent plants ploughed in green; as they improve in manurial condition, rye or winter oats may be grown and fed off with sheep eating cake or corn, thus consolidating the land and enriching it at the same time. Rye, oats, and barley are the only cereals that can be grown with any prospect of success. When laid down the seeds should consist chiefly of Dutch clover, trefoil, and vetches or tares, which will obtain nitrogen from the air for the future use of plants.

Boggy soils from which superfluous water has been removed are the only soils on which lime can be used with advantage, unless it be to benefit a flitting tenant. Lime, by combining with chemical ingredients prevalent in this class of soils, renders them better suited to the growth of plants, though at the same time it may liberate a quantity of ammonia which escapes from the soil and is lost. Oats are generally the first crop taken on land of this character after breaking it up, and should be followed if possible by potatoes, a crop which generally succeeds well

and reduces the land to a more workable tilth. Oats should again follow and then mangel, well manured, followed by a cereal crop. At this stage the land should be seeded down, after which the usual six-course rotation may be pursued.

The loamy and marly soils are best cultivated, as has already been intimated, with such variation as may be necessary owing to climatic or other causes. In some districts—parts of Lincolnshire, Yorkshire, Lancashire, and Cheshire—potatoes are largely grown, in which case I should reduce the rotation to a five-course, potatoes following the seeds. In Lancashire, where the occupations are of moderate extent and the land is highly manured and cultivated, three white straw crops would still be grown. Wherever practicable, catch-cropping is rapidly becoming a recognised principle. Tares, winter oats, kale, and many other crops are found to be of great value to the stock farmer. These crops are sown in succession. The early sown crops in many localities can be cleared off in time for a root crop, forced by artificial manures. Both at autumn and spring they produce a large amount of valuable succulent food early in the season. The later sown crops are cleared in time for a crop of common turnips, or for kale or winter oats, to come in the following spring. By such means the land is kept in rich manurial condition at a moderate outlay.

We frequently hear complaints as to the deteriorating effect of nitrate of soda, but the outcry is more sentimental than real. On some of the highest-rented and most productive lands within a four or five mile radius of Edinburgh, Italian rye-grass is largely grown, and the produce is sold green in the city market. The land is frequently let to a middleman for six months, who will take as many as three or four cuttings from the land during this short period. As soon as the corn is removed in the autumn, a heavy dressing of nitrate of soda is applied. In sheltered situations the first crop is ready early in April. For each succeeding crop a dressing of $1\frac{1}{2}$ to 2 cwt. per acre of nitrate is put on immediately the previous crop is secured. Under what by many may be deemed a scourging system of management, the land shows no deterioration in cereal produce.

In advocating the extended growth of forage, or catch crops, we are sure to hear a side whisper, How about the climate? I am familiar with the potato-growing districts of the south-western seaboard of Scotland, and nowhere do I find catch crops —kale, coleseed, and other plants—more successfully grown than they are there. In good seasons, indeed, few districts grow heavier crops or better quality of wheat and barley, the latter being well known and highly appreciated by the Burton

brewers. It is on the well-drained heavy clay soils that the introduction of the six-course system is producing the greatest revolution in increased production. Formerly, three crops and a bare fallow was the system all but universally practised on such soils, the advocates of this course basing their theory on the facilities afforded for cleaning the land, and improving its manurial condition by exposure to atmospheric changes. The first, however, often proved abortive by being undertaken at the wrong time, and by the use of means utterly unsuited to the purpose. A perfect fallow can only be made by the plough, and the land must be broken up in a dry state.

I have long been imbued with the impression that well-drained clays can be kept clean by a skilful system of cropping and cultivation, and that catch-cropping can be carried out upon them to the greatest advantage when worked on the six-course system. The first year's seeds are mown early, and then folded by sheep eating cake or corn; the second year's seeds are folded, or part grazed with young cattle, the use of artificial foods being still continued. The seed layers are broken up early in February for the oat crop. This is followed by wheat, for which crop a dressing of 3 to 4 cwt. per acre of superphosphate (28 per cent. soluble) should be sown with the seed. As the spring advances, 1 cwt. of nitrate of soda should be sown broadcast over the land. Immediately the crop is harvested a succession of catch crops should be sown. If available, and if time permits, a light dressing of farmyard manure should be applied, and, in addition, 3 cwt. per acre of superphosphate, to be followed by 1 cwt. of nitrate of soda. These crops and the clovers will provide a succession of green crops throughout the summer. Part of the rotation should be devoted to the growth of kohl-rabi or mangel for supplying the cattle during the winter. The succeeding crop is barley, seeded down with broad clover. With the exception of beans and peas, which encourage the growth of weeds, the leguminous order of plants should be preferred, as collectors of nitrogen wherewith they enrich the soil.

By the means indicated a considerable head of stock can be maintained where formerly few were seen, the land can be kept thoroughly clean, and heavy crops of cereals of fine quality can be grown. The free use of superphosphate and basic slag will enable broad clover to flourish, whilst the occasional ploughing in of succulent green crops, and the great mass of decaying matter left in the soil by the clovers, will not only add to the fertility of the land, bnt will make it more friable and easily worked.

A few words now as to Mr. Morris's paper, read before the Surveyors' Institution. The replies to the queries which Mr. Morris circulated, are, on the whole, only moderately satisfactory, owing to their rather fragmentary character. There seemed, however, to be a general unanimity of opinion as to the waning popularity of the four-course system. It is a well-known fact that there has been considerable falling off in the area under wheat. This is generally attributed to the circumstance that when a higher range of prices prevailed, and in rigidly carrying out the four-course system, much land was devoted to the growth of wheat that, under any system of management, was utterly unsuited to produce profitable crops of that cereal. The prevalence of clover sickness, and of finger-and-toe in the root crops, was chiefly due to a too close repetition of these crops on the same land, and also to a lack of knowledge of the manurial ingredients removed from the soil by the clovers and root crops respectively. Where basic slag and superphosphate are freely used, the use of lime or chalk is injurious rather than useful.

Except it be on alluvial soils, where a small breadth of early peas can be grown for picking green, neither the bean nor the pea crop can be recommended, save when forming part of a forage crop. In the case of vetches or tares a mixture of beans is particularly useful as affording the crop mechanical support. On the chalky formations of the southern counties, notably in Berks, Hants, Wilts, and Dorset, the system of catch-cropping has long been practised. In fact, this has been the chief means of manuring the land and furnishing food for stock. The same remarks apply to the Stonebrash formations of Oxon and Gloucester. Even, however, in Norfolk, the cradle of the four-course system, it now begins to dawn on the minds of occupiers that an extended course is more profitable.

Taken on the average, rents have receded some twenty-five to thirty per cent., whilst the cost of labour has risen in something like an equal ratio. Owing to the now general use of labour-saving machinery on purely tillage farms, the cost of labour has only nominally increased. It is on the dairy and stock-breeding farms that the labour question is the more severely felt. So much is this the case, that I know good dairy farms, well equipped with buildings, which are now being turned into grazing farms. But with good beef at 6½*d.* per lb., the outlook is by no means cheering, and even with the low prices now ruling for milk, dairying on suitable soils pays, I think, better than grazing.

My opinion is that Mr. Morris is in error when he says that

probably on by far the greater number of estates the four-course is the recognised system. This would apply to twenty years ago, but it is certainly not the case now. I agree with Mr. Morris that no uniform system of cropping ever was applicable to all lands, and hence the injurious effects of stereotyped agreements. Though he is willing to allow considerable latitude in the rotation he adopts, if suitable to the soil and locality, at the same time I could not go the length of cropping as he likes, whether he chooses a four-, five-, or six-course. It is only just to the interests of the landlord, or of the incoming tenant, that the correct proportion of seeds and fallows should be left, in accordance with the system on which the farm has been cultivated. An instance is adduced of the abortive effort to grow roots on strong land, but this is not likely to be followed by an intelligent farmer of the present day. There are different qualities of clay land, and the best clays will certainly give a much better return under a skilful system of cultivation than they will when laid down to grass.

The advice to reduce the arable area to the lowest possible limit must surely be a mistake. Every farmer knows that a mixed occupation will keep more stock than the same land will do if laid away to grass; also which brings in the largest returns at the present moment,—the mixed occupation with its dairy, its breeding and feeding, where the cereal produce can be utilised to the best advantage, or the secondary pastures, where only store stock can be run during the summer months, and which have no provision for winter food to save purchasing in the open market. The illustration of the 300-acre farm, half permanent, with fifty acres newly laid down, is one that would entail very considerable outlay, and probably at the end of the first six years it would barely be worth the rent and taxes. My advice would be to adopt the six-course shift, to keep more stock, to consume the chief part of the produce on the land, to grow a series of catch crops whenever practicable, and to improve the existing grass land by summer folding. I am persuaded that if this system was more generally carried out, it would not only improve the land, but also the financial position of the tenant. We have numerous practical illustrations in the successful management of the run-out clay lands in the county of Essex, where the north-country men have taken root, and live and thrive to the evident benefit at least of one class—the owners of the soil.

The growth of three straw crops in succession is certainly opposed to all preconceived ideas of good management, and

should be treated as a dilapidation. Few will dispute the assertion that only good crops pay; but such crops cannot be obtained save by good management and a liberal use of suitable manures. As to the extended growth of roots, even on suitable soils, I think few practical men will agree. This is the most expensive crop to cultivate and, when drawn off, the most exhaustive of the whole series. In times past its value has been greatly over-estimated, for with 85 to 90 per cent. of water, the feeding properties are not great, and roots are now used much more sparingly than was formerly the case. The gist of the whole matter is the desirability of the cultivation of catch crops for eating on, and so enriching, the land during the summer months—a proposition which may be dismissed without further comment.

Some reference was made to the "Agricultural Holdings Act, 1883." My experience is that the Act, where intelligently carried out, has been of immense benefit to the agricultural interests. What could be fairer than the valuation of the improvement to an incoming tenant? The Act is divided into three separate and distinct parts, the first two of which deal with improvements of a permanent and durable character, perfectly distinct from acts of husbandry, and with hay, straw, manure, and the cropping and general state of the land. The tenant sinks his interest in all permanent improvements if he fails or neglects to give the statutory notices required under the Act. In arranging with the owner or his agent, it is competent to agree upon a fixed period over which the supposed improvement is to extend, or it can be taken at the value of the improvement to an incoming tenant, which best protects the mutual interests of the contracting parties. The third part of the first schedule can either be dealt with under the strict provision of the Act, or by custom or agreement. Custom, or "as a man enters so he quits," is held to represent his title to the subject. No agreement which is not equal to the Act is binding on the tenant, who is allowed considerable latitude. In this particular case he cannot claim under the Act for one part, and under custom or agreement for another, but he has the option of choosing as to which he will accept.

The Midland Counties Tenant-Right Valuers' Association, which has been in existence for a period of upwards of twenty years, is the most representative, fair, and equitable of any in the country. It is composed of practical men, agents and valuers; a maximum scale is laid down for the guidance of the members; dilapidations are charged, and extra allowance is made where the fallow land is left in a clean state. This body,

therefore, is not open to the charge of discouraging the cultivator from leaving his land in the best possible condition.

The want of confidence in the broad acres of our country is not so much due to agricultural depression and the cycle of low prices as to probable or possible political changes, which obscure the agricultural horizon. Whatever changes are in store for us, we may depend upon this, that the lands of Great Britain will continue to be stocked and tilled.

With one exception, the discussion of Mr. Morris's paper turned chiefly on matters of ancient history. We live, however, in the present, and our hopes and aspirations are centred in the future. Some of the leading discoveries of the last few years had a narrow escape of passing unnoticed. It is now open to demonstration that certain plants obtain large quantities of nitrogen from the air. Another canon of ancient faith has been rudely shaken by the discovery that nitrification proceeds slowly, if at all, below a depth of ten inches from the surface. The light which has recently been thrown on these subjects will in future largely modify our systems of cultivation and manuring, and will probably lead to more productive crops.

Improvements in the cultivation of the soil, and in the breeding and feeding of live-stock, were aided and accelerated by the introduction and development of the four-course system during the long period of two hundred years. Changing circumstances necessitate a new departure. Science has proved stronger than political economy, and through the aid of steam the virgin prairies of the Far West have been requisitioned to supply our material wants. The competition from which British Agriculture has long been suffering appears to intensify rather than to decrease. It is small consolation, and a weak argument, to adduce that, because the wheat-producing lands of the United States have all or nearly all been absorbed by settlers, and that in a few years the productive powers of the soil will barely suffice to supply the native population, we accept as practically correct the contention that the area suited to the growth of wheat is incapable of large extension. Will the tillers of the American soil long remain content with the meagre average yield of 12 bushels per acre? The men who are leaving these shores and settling on the wheat lands of America will in a few years more than double the present output. The recent scientific discoveries will be to them a boon of which they will not fail to avail themselves. The growth of leguminous crops for the collection of free nitrogen, and the use of cheap artificial fertilisers, will enable them to steadily increase the yield of wheat, which some four centuries ago was in England estimated at only nine bushels per acre. I

do not take a pessimistic view of British Agriculture, at least as to the cultivation of our lands, and the improvement and management of our live-stock. The scientific acquirements and practical intelligence of the coming race of tillers of the soil will carry out the business of production on new and improved lines, as regards both cost and increased produce.

The four-course system is no longer suited to the times. The British farmer must turn his attention to the improvement of his livestock, and to the production of meat and of milk. Let him increase the area of leguminous crops, and, with a cycle of low prices, use the cereal produce of the land as food for his stock. Let him cultivate pure breeds, which will always command good prices and a keen demand from foreign buyers. Let him, in addition, direct his attention to the growth of a fine quality of malting barley, and, with a combination of such results, some degree of success will attend his efforts.

GILBERT MURRAY.

THE TRIALS OF PLOUGHS AT WARWICK.

CONSIDERING that the plough is one of man's oldest implements of husbandry, that hardly twenty years have elapsed since the last trials of ploughs by the Society at the Hull Meeting of 1873, and that for many years before that date frequent "ploughing matches" stimulated not only the improvements of construction and design in ploughs, but also the ploughman in the exercise of his craft, it has been suggested that little was to be gained by fresh trials of an implement about which all was supposed to be known.

Some slight foundation for such a statement might present itself to the casual observer, even within the limits of this country. Nevertheless, a very considerable change has taken place since 1873, not merely in modifications of detail, but in the nature of the work to be performed by the plough; and it is very interesting to look back to the report by the Senior Steward of Implements, Mr. W. J. Edmonds, at the Hull Trials, as given in the Journal (Vol. IX., S.S., Part II., 1873), wherein an opinion is expressed as to the direction which future developments of the plough would take. The following is an extract from his report:—

It appears to me that the plough, of whatever make, *has now many rivals*; formerly it was the chief implement, and the drag and the harrows were its

adjuncts, but when we see the broad shares, cultivators, and scarifiers, the chisel-pointed and duck-footed drags and harrows, we naturally inquire for what purpose were all these articles invented? And the trial field at Hull suggested to me the answer, viz., that *some combination* of them will in many cases be made to supersede the use of the plough in preparing land for barley and roots.

Whether the prediction made by Mr. Edmonds, or the appearance of the American Oliver or digging plough, was the stronger incentive to makers in this country, it is not our object to inquire. Suffice it to say that, if there is a *bonâ fide* demand, it always has been, and will continue to be, readily met by our manufacturers. It does appear that since the trials at Hull there has been a considerable departure in favour of this class of plough, and hence the desirability of fresh trials.

The classes into which the trials were divided, together with the names of the competitors, and the distinctive marks of the ploughs, are given in the accompanying table, to which have been added for convenience the awards of the Judges.

PLOUGHS COMPETING AT THE TRIALS HELD IN THE NEIGHBOURHOOD OF WARWICK,

On March 21st to 26th, 1892.

ENTRIES IN EACH CLASS.

(In each of the eight classes, a First Prize of 10*l.* and a Second Prize of 5*l.* were offered. The ploughs to which the prizes were awarded are marked with an asterisk (*) for the First Prize of 10*l.*, and a dagger (†) for the Second Prize of 5*l.*, the names of the makers of the winning ploughs being printed in capitals.)

Class I.—*Single-furrow Ploughs for Light Land.*
(13 entries, 11 competing.)

Distinguishing No. of Plough.	Name and Address of Exhibitor.	Distinguishing Mark of Plough.	Price. £	*s.*	*d.*
1	*W. Ball & Sons, Ltd., Rothwell, Kettering	B C 5	4	19	0
2	John Cooke & Sons, Lindum Plough Works, Lincoln	X L R C	4	6	0
3	John Cooke & Sons, Lincoln	R N 1	3	2	0
4	†Thomas Corbett, Perseverance Iron Works, Shrewsbury	H L	5	7	6
5	Thomas Corbett, Shrewsbury	W A	4	17	6
6	Eddy & Sons, Kennford Works, Exeter	K 3 W	4	5	0
7	John Perkins & Sons, Lichfield, Staffs	W J 2	5	5	0
8	John Perkins & Sons, Lichfield	W J 2	4	15	0
11	John Shores, Owston Ferry, Rotherham	Warp 0	4	4	0
12	J. C. & T. Yates, Doncaster	I C S	4	5	0
13	J. C. & T. Yates, Doncaster	I C S	4	7	6

Class II.—*Single-furrow Ploughs for Strong Land.*
(11 entries, 8 competing.)

Distinguishing No. of Plough.	Name and Address of Exhibitor.	Distinguishing Mark of Plough.	Price. £	*s.*	*d.*
14	*W. Ball & Sons, Ltd., Rothwell, Kettering	B C 9	5	11	6
15	John Cooke & Sons, Lincoln	K L 2	4	11	0
16	John Cooke & Sons, Lincoln	X L 1	4	12	0
17	Thomas Corbett, Shrewsbury	H P	5	13	6

CLASS II.—*continued.*

Distinguishing No. of Plough.	Name and Address of Exhibitor.	Distinguishing Mark of Plough.	Price. £	s.	d.
18	Thomas Corbett, Shrewsbury	H P C	5	17	6
22	†JOHN PERKINS & SONS, Lichfield	W P U	5	10	0
23	J. C. & T. Yates, Doncaster	D 1	4	7	6
24	J. C. & T. Yates, Doncaster	D 1	4	7	6

CLASS III.—*Single-furrow Ploughs, best adapted for Press Drill and broadcast sowing.*

(8 entries, 6 competing.)

25	John Cooke & Sons, Lincoln	C U M	5	10	0
26	John Cooke & Sons, Lincoln	X L S S	5	5	0
27	*THOMAS CORBETT, Shrewsbury	W W I	5	17	6
29	Eddy & Sons, Kennford, Exeter	K 2 X	5	0	0
31	J. C. & T. Yates, Doncaster	C S 2	5	2	6
32	†J. C. & T. YATES, Doncaster	D 1	5	5	0

CLASS IV.—*Two-furrow Ploughs.*

(8 entries, all competing.)

33	*W. BALL & SONS, LTD., Rothwell, Kettering	B C 4 D	9	7	6
34	John Cooke & Sons, Lincoln	X L R N	7	16	0
35	John Cooke & Sons, Lincoln	N N F 3	6	5	0
36	Thomas Corbett, Shrewsbury	—	9	10	0
37	Davey, Sleep, Harris & Co., Plymouth	Climax	14	14	0
38	Eddy & Sons, Kennford, Exeter	K L A	7	0	0
39	J. C. & T. Yates, Doncaster	E E	7	0	0
40	†J. C. &. T. YATES, Doncaster	D W	8	0	0

CLASS V.—*Three-furrow Ploughs.*

(4 entries, 3 competing.)

41	John Cooke & Sons, Lincoln	N N F 3	7	6	0
42	John Cooke & Sons, Lincoln	C O V	6	6	0
43	*J. C. & T. YATES, Doncaster	T E	8	10	0

CLASS VI.—*Digging Ploughs for Light Land.*

(10 entries, 9 competing.)

45	W. Ball & Sons, Ltd., Rothwell, Kettering	B R O	4	0	0
46	John Cooke & Sons, Lincoln	R U S	3	11	0
47	John Cooke & Sons, Lincoln	Lindum	4	0	0
48	*THOMAS CORBETT, Shrewsbury	W C D	4	5	0
49	Thomas Corbett, Shrewsbury	W	3	17	6
50	Davey, Sleep, Harris & Co., Plymouth	Triumph	8	15	0
51	Eddy & Sons, Kennford, Exeter	X X I I	3	5	0
53	John Perkins & Sons, Lichfield	W G	4	0	0
54	†J. C. & T. YATES, Doncaster	G 2	4	0	0

CLASS VII.—*Digging Ploughs for Heavy Land.*

(9 entries, 6 competing.)

55	John Cooke & Sons, Lincoln	Lindum	4	0	0
56	John Cooke & Sons, Lincoln	R U S 40	4	0	0
57	†THOMAS CORBETT, Shrewsbury	W D	4	10	0
58	Thomas Corbett, Shrewsbury	R M B	5	15	0
59	Eddy & Sons, Kennford, Exeter	X 3 W	3	15	0
62	*JOHN PERKINS & SONS, Lichfield	M 2	4	0	0

CLASS VIII.—*One-way Ploughs.*

(9 entries, 7 competing.)

64	Richard Bawden, South Molton, Devon	—	7	0	0
65	John Cooke & Sons, Lincoln	T R 1	9	10	0
66	John Cooke & Sons, Lincoln	T. No. 1 x	8	7	0

CLASS VIII.—*continued.*

Distinguishing No. of Plough.	Name and Address of Exhibitor.	Distinguishing Mark of Plough.	Price. £	s.	d.
67	*DAVEY, SLEEP, HARRIS & CO., Plymouth	Climax	8	12	6
68 Equal	†DAVEY, SLEEP, HARRIS & CO., Plymouth	Invincible	8	10	0
69 Equal	†EDDY & SONS, Kennford, Exeter	K A	5	15	0
70	Eddy & Sons, Kennford, Exeter	K 7 2	4	10	0

The trials were originally arranged to take place in February, but, owing to severe frost, they had to be postponed twice, and ultimately commenced on Monday, March 21, the Saturday previous having been spent by the Steward, Judges, and Engineer in finally apportioning the plots of ground, weighing the ploughs, and completing other arrangements for trial.

The Light Land Classes were the first to be tried, for which purpose three fields on Mr. Hortin's farm at Longbridge, 1½ miles from Warwick, were selected. The soil is a friable gravelly loam; it was in beautiful condition for ploughing and free from twitch or weeds of any kind.

The field in which the trials of Classes I. and III. took place was an old ley.

The field set apart for the trials of Classes IV., V., and VI. had been cropped with roots and fed off with sheep.

The third field was in stubble, which had received a light coat of farmyard manure. In the upper portion of this field Class VIII. was tried, while the main portion of it was reserved for the dynamometer trials of all the Light Land Classes.

The Judges were:

Mr. MASON COOKE, The Lawns, near Ely.
Mr. HENRY GOODYEAR, The Austerby, Bourne, Lincolnshire.
Mr. WILLIAM NEWTON, Crowmarsh Battle, Wallingford.

They were relieved of much responsibility in that they were not called upon to give any expression of opinion as to the relative values of the several functions of a plough, the special features to be noted having been carefully arranged, and the precise numerical value assigned to each, by the Society.

The scale of points representing perfection, as laid down by the Society, was as follows:—

Single-furrow Ploughs (Classes I.-III.).

Price	10
Mechanical qualities and strength	20
Simplicity	10
Draught relatively to work done	20
[1] Flatness of sole of furrow	10
Squareness of cut on land side	5
Perfection of work and burying vegetation	20
Efficiency of skim coulter	5
Total	100

[1] Not considered in the case of entries in Class III.

Two- and Three-furrow Ploughs (Classes IV. and V.).

Price	10
Mechanical qualities and strength	20
Simplicity	10
Draught relatively to work done	20
Ease of management in work and in turning	15
Facilities of transport	5
Flatness of sole of furrow	10
Squareness of cut on land side	5
Perfection of work and burying vegetation	20
Efficiency of skim coulter	5
Total	120

Digging Ploughs (Classes VI. and VII.).

Price	10
Mechanical qualities and strength	20
Simplicity	10
Draught relatively to work done	20
Flatness of sole of furrow	10
[1] Perfection of work and burying vegetation	25
Efficiency of skim coulter	5
Total	100

One Way Plough (Class VIII.).

The points of merit here were left to the Judges and the Engineer, and they adopted the following scale:—

Price	10
Mechanical qualities and strength	20
Simplicity	10
Draught relatively to work done	25
Ease of management and ease in turning	15
Flatness of sole furrow	10
Squareness of cut on land side	5
Perfection of work and burying vegetation	20
Efficiency of skim coulter	5
Total	120

The trials commenced with Class I., single-furrow ploughs for light land, eleven ploughs competing. Each implement was set to make two ridges and one empt within the plot allotted to it. This was followed out in all the classes with the exception of that for one-way ploughs. The depth of furrow was 5 inches, and the width was left optional; this latter varied from 7½ up to 10 inches with the different competitors. Of the eleven ploughs competing, viz.:—

No.	Name.	Address.	Width, in.
4	Thomas Corbett	Shrewsbury	8¼
12	J. C. & T. Yates	Doncaster	7½
6	Eddy & Sons	Exeter	8
2	Cooke, John & Sons	Lincoln	8¼

[1] Perfection of work being: to make a good seed bed; to do work best adapted for the purposes of winter fallow.

No.	Name.	Address.	Width, in.
1	Ball and Sons	Kettering . .	$8\frac{1}{4}$
7	Perkins, J. & Sons . . .	Lichfield . .	9
11	Shores, John	Rotherham . .	$9\frac{1}{2}$
5	Thomas Corbett	Shrewsbury . .	8
3	Cooke, John & Sons . . .	Lincoln . . .	10
8	Perkins, J. & Sons . . .	Lichfield . .	9
13	J. C. & T. Yates	Doncaster . .	$8\frac{1}{4}$

no less than seven (Nos. 1, 2, 4, 5, 8, 12, 13,) were selected for trial on the dynamometer. Subsequently these seven ploughs were again subjected to a further trial, with the final result that the first prize was awarded to Messrs. Ball & Sons, Ltd., for their plough, B C 5, No. 1 in catalogue, and the second prize to Mr. Thos. Corbett for his H L plough, No. 4 in catalogue. The comparative excellence of the work may be judged from the points awarded, as shown in the table on page 314.

Class III.—*Single-furrow Ploughs* best adapted for a press drill and broadcast sowing were tried in the same field, the depth of furrow being fixed at 6 inches. There were six competitors :—

No.	Name.	Address.	Width, in.
25	Cooke, J. & Sons	Lincoln . . .	8
29	Eddy & Sons	Exeter . . .	$8\frac{1}{4}$
31	Yates, J. C. & T.	Doncaster . .	$8\frac{1}{2}$
27	Corbett, Thos.	Shrewsbury . .	$8\frac{1}{2}$
32	Yates, J. C. & T.	Doncaster . .	$8\frac{1}{2}$
26	Cooke, J. & Sons	Lincoln . . .	9

These all started simultaneously, and three (Nos. 27, 31, and 32) were selected for trial upon the dynamometer, but it was not until two of these were tried again that the award of the second prize could be made. The final award was first prize to Mr. Thos. Corbett's plough, W W 1, No. 27 in catalogue, and the second prize to Messrs. J. C. and T. Yates's plough, D I, No. 32 in catalogue.

Class IV.—*Two-furrow Ploughs.* Here there were eight competitors :—

No.	Name.	Address.	Width, in.
34	Cooke, J. & Sons	Lincoln . . .	10
39	Yates, J. C. & T.	Doncaster . .	—
33	Ball & Sons	Kettering . .	8
38	Eddy & Sons	Exeter . . .	9
37	Davey, Sleep, Harris & Co. . .	Plymouth . .	—
36	Corbett, Thos.	Shrewsbury . .	9
40	Yates, J. C. & T.	Doncaster . .	$8\frac{1}{2}$
35	Cooke, J. & Sons	Lincoln . . .	11

The depth of furrow was set at 5 inches, the width as before being optional. One plough entered, being a one-way plough, could not fulfil the requirements of the Judges, namely, plough two ridges and make one empt, and was therefore withdrawn. It nevertheless did some capital work, laying the soil very level and well. Three of the competing ploughs (Nos. 33, 36, and 40) were selected for trial on the dynamometer, where the work done by all was excellent and very uniform. The following was the order of the award: First prize, Messrs. W. Ball & Sons, plough B C 4 D, No. 33 in catalogue; second prize, Messrs. J. C. and T. Yates, plough D W, No. 40 in catalogue.

Class V.—*Three-furrow Ploughs.* Three ploughs came forward for competition:—

No.	Name.	Address.	Width, in.
41	Cooke, J. & Sons	Lincoln	10
43	Yates, J. C. & T.	Doncaster	9
42	Cooke, J. & Sons	Lincoln	10

The depth of furrow was again set at 5 inches, the width being optional. The lighter of Messrs. Cooke & Sons' ploughs did its work remarkably well, but it was considered by the Judges as being too light for general use, and was therefore not sent forward for trial on the dynamometer, though where ground is not too hard it would prove a valuable implement as a skimmer. The other two ploughs were tested on the dynamometer, and it was unfortunate that the work set out by Messrs. Cooke's plough was so irregular, and that the plough itself was not handled with greater dexterity. The first prize in this class was awarded to Messrs. Yates's plough, T E, No. 43 in catalogue.

Class VI.—*Digging Ploughs for Light Land.* In this class there were nine competitors:—

No.	Name.	Address.	Depth, in.
48	Corbett, Thos.	Shrewsbury	11
50	Davey, Sleep, Harris & Co.	Plymouth	—
45	Wm. Ball & Sons	Kettering	11
54	Yates, J. C. & T.	Doncaster	10
46	Cooke, J. & Sons	Lincoln	11
53	Perkins & Sons	Lichfield	10
51	Eddy & Sons	Exeter	12
47	Cooke, J. & Sons	Lincoln	12
48	Corbett, Thos.	Shrewsbury	11

Probably more interest attached to the trials in this class than to those in any of the preceding classes. The work was set at 5 inches depth, the width being optional, and ranging from

10 to 12 inches, the result being that some excellent work was done, and a beautiful seed bed was prepared, the furrow being so well broken that no harrowing would be required. The Judges decided to send five of these ploughs (Nos. 46, 47, 48, 51, and 54) forward for trial on the dynamometer, where also the work of the first three ploughs was of first-class quality. Some notes on the relative draught of these ploughs supplement the tables of the dynamometer trials. The awards were made as follows; first prize, Mr. Thos. Corbett's plough, W C D, No. 48 in catalogue; second prize, Messrs. J. C. & T. Yates's plough, G 2, No. 54 in catalogue.

Class VIII.—*One-way Ploughs.* In order to complete the trials of ploughs for light land, this class was taken next in order. There were seven competitors:—

No.	Name.	Address.	Width, in.
67	Davey, Sleep, Harris & Co.	Plymouth	$7\frac{3}{4}$
69	Eddy & Sons	Exeter	10
68	Davey, Sleep, Harris & Co.	Plymouth	8
65	Cooke, J. & Sons	Lincoln	10
64	Bawden, Richard	South Molton	12
70	Eddy & Sons	Exeter	9
66	Cooke, J. & Sons	Lincoln	$9\frac{3}{4}$

Some of the ploughs were excellently designed for the purpose they had to fulfil. The depth of furrow was set at 5 inches, the width of furrow ranged from $7\frac{3}{4}$ inches up to 12 inches. The work done in this class was very good, and five out of the seven ploughs competing (Nos. 66, 67, 68, 69, and 70) were selected for further trial on the dynamometer. The following were the awards: first prize, Messrs. Davey, Sleep, Harris & Co.'s plough "Climax," catalogue No. 67; second prize divided between Messrs. Davey, Sleep, Harris & Co.'s plough "Invincible," catalogue No. 68, and Messrs. Eddy & Sons' plough K A, catalogue No. 69.

The trials of the ploughs in the two Strong Land Classes were made in a field on the farm of Mr. John Palmer at Hampton-on-the-Hill. Here also the land was in excellent condition for ploughing, and as clean as a garden. The field was wheat stubble, and had received a coating of farmyard manure in the autumn. It was a fairly strong red clay, especially the upper part, upon which Class II., "Single Furrow Ploughs for Strong Land," were worked, and admirably adapted it proved to be for them.

The trials of both Strong Land Classes were started almost simultaneously, there being six competitors in each class.

[*Continued on page* 317.]

TABLE I.—*Results of Trials of Ploughs in Classes I., II., III.*

Class and description	Catalogue number	Name of exhibitor	Weight	Price	Length from point of share to end of breast	No. of field	Mark of plough	No. of horses	Points of merit awarded: Price	Mechanical qualities and strength	Simplicity	Draught relatively to work done	Flatness of sole of furrow	Squareness of cut on land side	Perfection of work and burying vegetation	Efficiency of skim coulter	Total	Remarks
									Perfection being 10	20	10	20	10	5	20	5	100	
I.			cwt. qr. lb.	£ s. d.	ft. in.													
Single-furrow ploughs for light land	1	Ball & Sons	1 3 $2\frac{1}{2}$	4 19 0	4 4	1	B C 5	2	9	13	10	20	10	5	20	5	92	1st prize
	4	Corbett, Thos.	2 1 $21\frac{1}{2}$	5 7 6	4 $2\frac{3}{4}$	1	H L	2	6	20	10	18	10	5	12	5	86	2nd prize
	5	Corbett, Thos.	2 0 $19\frac{1}{2}$	4 17 6	4 2	1	W A	2	8	18	10	15	10	5	14	5	85	—
II.																		
Single-furrow ploughs for strong land	14	Ball & Sons	2 2 $1\frac{1}{2}$	5 11 6	4 7	4	B C 9	2	9	15	10	20	10	5	20	5	94	1st prize
	22	Perkins & Sons	2 3 $22\frac{1}{2}$	5 10 0	5 1	4	W P U	2	8	18	10	15	10	5	18	5	89	2nd prize
	18	Corbett, Thos.	2 2 14	5 17 6	5 $2\frac{1}{4}$	4	H P C	2	7	18	10	17	10	5	16	5	88	—
III.																		
Single-furrow ploughs best adapted for press drill and broadcast sowing	27	Corbett, Thos.	2 2 22	5 17 6	4 4	1	W W 1	2	9	20	10	16	10	5	18	5	93	1st prize
	32	Yates, J. C. & T.	2 2 $16\frac{1}{2}$	5 5 0	5 $3\frac{1}{4}$	1	D 1	2	9	15	8	18	10	5	20	5	90	2nd prize
	31	Yates, J. C. & T.	2 2 7	5 2 6	5 $4\frac{3}{4}$	1	C S 2	2	9	15	8	20	10	5	12	3	82	—

TABLE II.—*Results of Trials of Ploughs in Classes IV. and V.*

Class and description	Catalogue number	Name of exhibitor	Weight	Price	Length from point of share to end of breast	No. of horses	No. of field	Mark of plough	Points of merit awarded: Price	Mechanical qualities and strength	Simplicity	Draught relatively to work done	Ease of management in work and in turning	Facilities of transport	Flatness of sole of furrow	Squareness of cut on land side	Perfection of work and burying vegetation	Skim coulter	Total	Remarks
								Perfection being	10	20	10	20	15	5	10	5	20		115	
			cwt. qr. lb.	£ s. d.	ft. in.															
IV. Two-furrow ploughs	33	Ball & Sons	3 0 6	9 7 6	4 2½	2	2	B C	8	15	8	20	10	5	10	5	20	No skim coulter used	101	1st prize
	40	Yates, J. C. & T.	3 3 6	8 0 0	4 0	2	2	D W	9	15	7	16	15	5	10	5	18		100	2nd prize
	36	Corbett, Thos.	3 3 12	9 10 0	3 10½	2	2	—	6	16	7	15	9	5	10	5	16		89	—
V. Three-furrow ploughs	44	Yates, J. C. & T.	4 2 15	8 10 0	3 6	2	2	T E	9	20	10	15	15	5	10	5	20		109	1st prize
	41	Cooke, J. & Sons	4 0 3	7 6 0	—	2	2	N N F 3	6	10	5	15	5	5	0	5	5		56	—

Table III.—*Results of Trials of Ploughs in Classes VI. and VII.*

Class and description	Catalogue number	Name of exhibitor	Weight	Price	Length from point of share to end of breast	No. of horses	No. of field	Mark of plough	Points of merit awarded: Price	Mechanical qualities and strength	Simplicity	Draught relatively to work done	Flatness of sole of furrow	Perfection of work and burying vegetation	Efficiency of skim coulter	Total	Remarks
								Perfection being	10	20	10	20	10	25	5	100	
			cwt. qr. lb.	£ s. d.	ft. in.												
VI. Digging ploughs for light land	48	Corbett, Thos. .	2 1 11	4 5 0	3 1	2	2	W C D	9	20	10	16	10	22	5	92	1st prize
	54	Yates, J. C. & T.	2 0 25	4 0 0	3 1½	2	2	G 2	9	18	9	15	10	18	5	84	2nd prize
	46	Cooke, J. & Sons	1 3 17	3 11 0	3 3	2	2	R U S	9	15	9	20	7	15	4	79	—
VII. Digging ploughs for strong land	62	Perkins & Sons .	2 1 23½	4 4 0	3 1	2	2	M 2	10	18	10	20	10	24	5	97	1st prize
	57	Corbett, Thos. .	2 2 6	4 10 0	3 2	2	2	W D	6	18	10	18	10	19	5	86	2nd prize
	59	Eddy & Sons . .	2 0 20½	3 15 0	2 11	2	2	X 3 W	8	15	10	15	7	21	5	81	—

Table IV.—*Results of Trials of Ploughs in Class VIII.*

Class and description	Catalogue number	Name of exhibitor	Weight	Price	Length from point of share to end of breast	No. of horses	No. of field	Mark of plough	Points of merit awarded: Price	Mechanical qualities and strength	Simplicity	Draught relatively to work done	Ease of management in work and turning	Flatness of sole of furrow	Squareness of cut on land side	Perfection of work and burying vegetation	Efficiency of skim coulter	Total	Remarks
								Perfection being	10	20	10	25	15	10	5	20	5	120	
			cwt. qr. lb.	£ s. d.	ft. in.														
VIII. One-way ploughs	67	Davey, Sleep, Harris & Co.	3 3 24	8 12 6	5 3	2	3	Climax	8	14	9	20	14	10	5	20	5	105	1st prize
	68	ditto	4 1 11	8 10 0	5 3	2	3	Invincible	7	15	8	15	12	10	5	20	5	97	} 2nd „
	69	Eddy & Sons	3 1 14	5 15 0	3 10½	2	3	K 1	9	12	7	19	14	10	5	16	5	97	

Class II.—*Single-furrow Ploughs for Strong Land.* The work was set at six inches depth of furrow, the width being optional. Of the six competitors—

No.	Name.	Address.
22	Perkins, J. & Sons	Lichfield;
18	Corbett, Thos.	Shrewsbury;
14	Ball & Sons	Kettering;
23	Yates, J. C. & T.	Doncaster;
16	Cooke & Sons	Lincoln;
17	Corbett, Thos.	Shrewsbury,

four were selected for trial on the dynamometer, viz., Nos. 14, 18, 22, and 23.

The result, as indicated by the tables, shows the competition between the first three ploughs to have been very close indeed. The first prize was awarded to Messrs. Ball & Sons' plough B C 9, catalogue No. 14. The second prize went to Messrs. John Perkins & Sons' plough W P U, catalogue No. 22.

Class VII.—*Digging Ploughs for Heavy Land.* In this class the depth of furrow was varied, commencing at 6 inches and increasing to 8 inches, and ultimately to 10, and although only two horses were used, as in all the other field trials, it must not be inferred that the implements could be drawn by two for a day's work. In this case, especially at the greater depth, at least four horses would be required. Here, as in Class VI., some excellent work was done, the furrows being well broken and laid level, making a firm seed bed. Of the six competitors—

No.	Name.	Address.
55	Cooke, J. & Sons	Lincoln;
58	Corbett, Thos.	Shrewsbury;
59	Eddy & Sons	Exeter;
57	Corbett, Thos.	Shrewsbury;
62	Perkins, J. & Sons . . .	Lichfield;
56	Cooke, J. & Sons	Lincoln,

four (Nos. 57, 58, 59 and 62) were selected for further trial on the dynamometer. The final awards were, first prize, Messrs. John Perkins & Sons' plough M 2, catalogue No. 62; second prize, Mr. Thos. Corbett's plough W D, catalogue No. 57.

Although, in the tables, the performance of only the first three ploughs is recorded, in this class mention may be made of Mr. Thos. Corbett's plough R M B 3 as differing in design from any others in the class. Instead of the ordinary turn-furrow this plough had a revolving disc, worked by the pressure of the earth against it. It did capital work at six inches' depth

of furrow, and laid and broke the furrow to perfection; but at the greater depths of eight and ten inches it lost points considerably, and therefore was not regarded by the Judges as a generally useful plough.

The tables given on pages 314 to 316 summarise the work done in the various classes in the field trials. For these and the foregoing details we are indebted to Mr. W. Newton.

Dynamometer Trials.

Before proceeding to an examination of the tabulated results of these trials, a few preliminary notes as to the manner in which they were conducted, and how the figures were arrived at, may not only be of interest, but may further lead to a better appreciation of the results obtained, more particularly when it comes to making any kind of comparison between them and the tabulated results given of the last trials of horse ploughs made by the Society at Hull.

When it was decided to carry out the present trials, one of the first questions raised was whether the then existing plough dynamometer, which was used at Hull and at previous trials, was all that could be desired. Experience gained in its use, on several occasions, pointed out modifications in details which might advantageously be made with the view of facilitating its manipulation, and also of improving the registration of work done. In order that the records of these trials might be made as reliable as possible, the Society ordered a new dynamometer to be made, and it affords the writer (who had also used the older instrument) considerable satisfaction to be able to report the very uniform working and recording of the same in the present trials.

As in many tests of ploughs the draught is approximately measured by introducing between the horses and the plough a spring link or balance (which is not infrequently dignified by the name of a dynamometer), and the oscillations of the pointer, varying with every step of the horses as well as with the resistance offered, are merely estimated by the eye and noted, a general description of the instrument used may not be out of place.

A wrought-iron frame is mounted on three wheels with standards adjustable, both vertically and horizontally, two small wheels on one side running in the furrow and one larger wheel on the land side. The boss of this larger wheel is geared so as to take a pitch chain, which chain actuates by means of a worm and worm-wheel a brass drum, causing it to revolve, the ratio

between the speed of the driving wheel and the drum being such that for every run of one hundred yards' travel in ploughing the drum moves 4·0156 inches. An indicator paper is wrapped round the drum, and a pencil fixed to the framing of the instrument—mounted on a spring to give sufficient pressure on the paper for marking—draws a line the length of which indicates the length of run, and it also represents the zero line from which the amount of draught is measured, as described later. For reading off at once the distance travelled, a ring with a graduated scale is mounted on one end of the drum. At the commencement of a trial the zero on this scale is set opposite to a fixed pointer, the ring is then clamped to the drum, and revolves with it. At the end of the run the actual distance may at once be read off opposite to the pointer. In this way a duplicate register of the distance travelled is obtained.

In order to measure the draught a draw-bar passes from end to end of the dynamometer, the back end being provided with a hook for the attachment to the plough. On this draw-bar are mounted two spiral springs, one end of each of which bears against a disc keyed on to the draw-bar, while the other ends bear against the cross-framing of the dynamometer. It will thus be seen that, if a load is attached to the hook of the draw-bar and the dynamometer is pulled forward, the springs will be compressed in proportion to such load, and that the draw-bar will be given a certain travel corresponding with such compression. This travel is registered on the paper on the brass drum already described by a second pencil mounted in connection with the draw-bar. In this way, as the drum revolves a diagram is obtained, the fixed pencil drawing a straight line representing the distance travelled, while the other pencil, drawing an irregular curve, or, more correctly speaking, a zig-zag line, the depressions and elevations corresponding to the various fluctuations in draught. As, at starting, both pencils are set on the same line, it is only necessary to measure the vertical distance from the straight line drawn by the fixed pencil to any point of the upper curved line, and this will represent the draught at that particular point. A mean of a series of such measurements will represent the mean draught.

A further provision for recording the mean draught is made by means of integrating gear. A vertical gun-metal disc is actuated through the chain gearing from the main driving wheel; against the face of this disc works a small gun-metal roller wheel free to slide on a square spindle mounted in connection with the main draw-bar. As this small wheel revolves it rotates the square spindle, one end of which is connected up

to a dial-counter which registers the number of revolutions. When there is no pull on the draw-bar the small wheel is in contact with the centre of the disc, and consequently there is no motion, but so soon as any load comes on the bar the small wheel is pulled out from the centre, approaching more nearly to the periphery of the revolving disc as the load increases, and as it does so the speed of its rotation increases; in this way a numerical representation of the draught is given by the counter.

In order to take up any undue sudden strain which might come upon the springs from the plough fouling a large stone or root of a tree, the forward end of the draw-bar has a piston fitted on it working in an oil cylinder.

To give actual values to these representations of draught it is necessary to calibrate the instrument. For this purpose it is suspended vertically and weights are hung from the draw-bar, and the driving wheel is rotated so that it shall represent a given travel—say, one hundred yards. A diagram is recorded and the reading of the counter is taken. By repeating such tests with increasing loads, co-efficients are arrived at which, used as multipliers for the measurements of the diagram, and the numerical reading of the counter, give the actual draught in pounds at any time. This operation was gone through not only before the trials, but was repeated on the trial-ground immediately afterwards with the dynamometer under exactly the same conditions as those under which it had been working, and from the co-efficients thus arrived at the figures representing the amount of draught in the tables were calculated.

With the view of making the draught as uniform as possible for all the competitors, and of eliminating errors arising from irregular draught which would to some extent occur in drawing the ploughs with different teams of horses, it was arranged to haul the dynamometer to which the ploughs were attached by means of steam ploughing tackle, for which purpose a double set of Fowler's steam ploughing engines was provided. An engine was placed at each headland, and while one engine was hauling the dynamometer up the field, the rope of the other engine was being paid out and led by a man and horse to the upper end of the field ready for the next run down the field. Obviously in this arrangement there was a little difficulty in turning at each headland, the plough and dynamometer having to be hauled round by hand; but with many willing helpers this difficulty was reduced to a minimum, while the advantages of the more uniform pull, and the facility of regulating the engines' speed in comparative trials such as these, completely

outweigh any little delay or inconvenience in turning as compared with making such tests with horses.

I would here wish to acknowledge the assistance given by Mr. Canning, of Sherborne, from whom the engines were hired, not only in getting everything in readiness each day up to time and in having all instructions as to the working of the engines promptly carried out, but also for the willing aid rendered whenever opportunity offered.

The trials of the Light Land Classes I., III., IV., V., VI., VIII., were all made in the same field, where sufficient plots were arranged, to all intents and purposes practically similar; indeed, it would have been impossible to have selected a more favourable site. There was a very slight rise across the field, but this was uniform throughout this portion of it; so it in no way affected one competitor more than another. Thus a useful comparison of draught in the different classes may be made, which could not be done had they been tried in different fields.

The plots were set out about 120 yards long, in which a measured length of 100 yards was staked out for the dynamometer records. The competitors opened up their work in most cases, to save time, with horses, and so soon as they could get to their proper depth of furrow the dynamometer was attached, and a preliminary run up and down the field was allowed in order to give the ploughman an opportunity to make his final adjustments and to accustom him to the altered conditions of draught. After this, two runs up and down the field were taken, thus giving a 400 yards' register of the dynamometer. This distance is considerably in excess of that of former trials.

The work done by the ploughs in the dynamometer trials was similar as to depth and width to the work done in the first trials, and the quality of work in these trials was also considered when allotting the several points.

As must be the case in trials of all machinery, the results obtained to a considerable extent depend upon the ability and discretion of the man working it, so in the present instance some ploughs were set to work and, once started in a furrow attached to the dynamometer, required no handling, whereas in one or two instances the struggle which was going on between the ploughman and his plough not only resulted in producing slovenly work, but militated materially against his record for draught either by increasing it or making it irregular. In no class was this more noticeable than in Class V., for three-furrow ploughs. Although it was fully recognised throughout the whole trials that they were not to be treated as a "ploughing match," and that, as far as possible, the judgment was to be

made upon the plough, yet it is impossible to entirely eliminate the man, and the competitor ought to be sufficiently alive to his own interests to take care that they are not allowed to suffer in the hands of an unskilful workman.

The measure of the efficiency of the ploughs has, as on former occasions, been taken as the ratio between the draught in pounds and the weight of earth moved in a given distance. The first record is given by the dynamometer. To obtain the second of these a square yard of earth was removed to the depth ploughed, and weighed, and the results are tabulated in column 9 of the tables on the opposite page. The comparison between draught and weight of earth moved only holds good in trials made on similar land and under the same conditions, as it frequently happens that land which weighs less per cubic foot offers, from its more plastic nature, greater resistance to ploughing than land which is actually heavier in weight, but which, from its more friable nature, is less resistant. This is borne out by the comparison in the present instance of the trials in the Light and Heavy Land Classes.[1] This, together with different conditions of weather, must not be lost sight of in any comparison which is attempted with other records.

Through having all the trials of the Light Land Classes made in the one field and on such very similar plots, a useful comparison can be drawn between them, which could not have been done had they been tried on the various plots in the fields in which the earlier trials were made. In Classes I. and III. these trials took place in the old ley, to open up which would doubtless take more draught than the breaking up of similar land in stubble. The results obtained, however, would be in no way comparable with those obtained in Classes IV., V., and VI., which were tried in another field, or with those of Class VIII., tried in a third field.

For the Heavy Land Classes the dynamometer trials were made in the lower part of the same field as the earlier trials in such classes, the most level piece of the field being selected for such purpose; the land was somewhat lighter here than at the upper end of the field. These trials were conducted in precisely the same manner as already described in the Light Land Classes.

An interesting comparison may be made between the single, double, and three-furrow ploughs of any one maker. In such case the weight of ploughs does not increase in the same proportion as the weight of earth which they are capable of moving;

[1] The weight per cubic foot of each, reduced from the weights given in column 8 of the tables, is practically identical, though the difference in the nature of the land was quite evident.

consequently, as the capacity of the plough increases the effective draught tends to diminish, against which must be set the greater skill required for the handling of the double or three-furrow ploughs.

Light Land Ploughs. Classes I., III., IV., V., VI., VIII.

DYNAMOMETER TRIALS.

1	2	3	4	5	6	7	8	9	10
Class	Name of exhibitor	Cata-logue No.	Weight of plough	Size of furrow			Wt. of earth dis-turb-ed per yd. run	Ft. lb. of work per lb. of earth raised	Drau-ght in lb.
				Width	Depth	Area in sq. ins.			
I.			Cwt qr. lb.	"	"				
Single-furrow ploughs for light land	W. Ball & Sons	1	1 3 2½	8·25	4·98	41·1	99·9	6·55	218·1
	Thos. Corbett	4	2 1 21¼	9·25	5·35	49·5	120·5	7·19	288·7
	Thos. Corbett	5	2 0 19¾	8·75	4 85	42·4	103·3	7·59	261·0
	J. C. & T. Yates	12	—	8·0	5·07	40·5	93·7	8·18	269·0
III.									
Single-furrow ploughs for press drill and broadcast	Thos. Corbett	27	2 2 22	8·5	5·42	46·1	112·1	10·43	390·0
	J. C. & T. Yates	32	2 2 16½	8·5	4 96	42·2	102.7	9·56	327·0
	J. C. & T. Yates	31	2 2 7	8·5	6·0	51·0	124·2	9·48	392·4
IV.									
Two-furrow ploughs	W. Ball & Sons	33	3 0 6	16	5·16	82·6	200·9	6·45	432·3
	J. C. & T. Yates	40	3 3 6	17	4·96	84·3	205·4	7·28	498·0
	Thos. Corbett	36	3 3 12	18	4 86	87·5	213·0	7·40	525·0
V.									
Three-furrow ploughs	J. C. & T. Yates	44	4 2 15	27	4·40	118·8	288·7	6·71	645·0
	J. Cooke & Sons	41	4 0 3	30	5·17	155·1	377·5	6 37	801·0
VI.									
Digging ploughs for light land	Thos. Corbett	48	2 1 11	10·5	6·28	65·9	160·4	8·61	459·3
	J. C. & T. Yates	54	2 0 25	10·	5·42	56·9	138·5	8·99	414·9
	J. Cooke & Sons	46	1 3 17	11·	5·56	61·2	148·4	7·69	381·0
VIII.									
One-way ploughs	Davey, Sleep & Co.	67	3 3 24	8·0	5·15	41·2	100·2	9·46	315·0
	Davey, Sleep & Co.	68	4 1 11	8·0	5·51	44·1	107·3	10·73	384·0
	Eddy & Sons	69	3 1 14	9·5	5·57	52·9	128·8	8·91	382·2

Strong Land Ploughs. Classes II. and VII.

DYNAMOMETER TRIALS.

Class	Name of exhibitor	Cata-logue No.	Weight of plough	Size of furrow			Wt. of earth dis-turb-ed per yd. run	Ft. lb. of work per lb. of earth mov-ed	Drau-ght in lb.
				Width	Depth	Area in sq. ins.			
II.			Cwt. qr. lb.	"	"				
Single-furrow ploughs for strong land	W. Ball & Sons	14	2 2 1½	8·33	6	50	121·5	11·01	446·1
	Perkins & Sons	22	2 3 22½	8·5	6·32	53·7	130·5	13·29	578·3
	Thos. Corbett	18	2 2 14	8·5	6·23	52·9	128·6	12·66	543·1
VII.									
Digging ploughs for strong land	Perkins & Sons	62	2 1 23½	12	7·85	94·2	229·0	9·76	744·4
	Thos Corbett	57	2 2 6	12	8·31	99·7	242·3	10·65	861·0
	Eddy & Sons	59	2 0 2½	12	7·67	92·0	223·7	13·09	976·4

Again, in the case of the one-way ploughs it will be noticed that the weight of these ploughs is considerably more than that of the single-furrow plough with which they are comparable, and the draught is also considerably more than in the case of the latter. They, however, claim special advantages over the ordinary plough in facilities of turning, and in that they do much less damage at the headlands. Such no doubt is the case. The turning or "upsetting" motions in some of the ploughs competing were extremely simple and effective. They further claim the advantage of leaving a level surface all over the field. Where such a system can be adopted it no doubt facilitates other operations, such as the working of a mowing or reaping machine over it.

A comparison will no doubt at once be made between the draught of the single-furrow ploughs as compared with that of the digging ploughs in both the Light and Strong Land Classes. From the records in column 9 it will be noticed that the effective draught for the digging ploughs is a little in excess of that of the single-furrow ploughs. The conditions of trial, however, were not identical; in the case of the digging ploughs the weight of earth moved was greater than in the case of the single furrow in the same proportion as the area of furrow given in column 7. The increase of draught may therefore be more apparent than real, and there can be no question that, where the work is suitable for digging ploughs, the saving effected in subsequent operations is a matter of very great importance.

Looking at the results obtained, as recorded in the foregoing tables, one point would appear to be brought prominently forward—namely, the important factor the actual weight of a plough forms in the resultant draught. It will be noticed that although in some cases the difference of weight is not very great, still the lightest plough has, notably in the Light Land Classes, given the lightest effective draught, as recorded in column 9. This would seem to point to the conclusion that, so far as the form of the breast or share affecting merely the question of draught is concerned, makers appear to have arrived at a very uniform result. The question as to how far weight may be reduced in order to diminish the draught requires careful consideration. No farm implement has to withstand rougher usage than the plough, consequently lightness of draught may be too dearly bought if the necessary strength to withstand such usage is in any way imperilled.

In concluding this Report, I have much pleasure in expressing, on behalf of the Judges and myself, our appreciation of the ready and cheerful way in which the competitors generally

complied with all instructions given to them. Our thanks are also due to Mr. Percy Crutchley, the Senior Steward of Implements, for the admirable arrangements made; to Mr. Hortin and Mr. J. Palmer, on whose farms the trials were conducted, and to Mr. Hortin, jun., who efficiently filled the post of Assistant Steward; and, I might add, to the weather. Such assistance enabled the trials to be carried out without a hitch anywhere, and at the conclusion of them it was felt on all hands that, while no time had been wasted, nothiug had been left undone.

F. S. COURTNEY.

WILD BIRDS IN RELATION TO AGRICULTURE.

ECONOMIC ornithology, or the science of birds considered from an agricultural point of view, is a subject which for a long time has been in steep in my mind. I chanced to read a letter from Sir Herbert Maxwell, M.P., of which, in relation to the Scotch plague of mice, this pathetic passage was the text:—

> A few days ago a gamekeeper in the Stewartry went to examine a trap which he had set for hawks. He found one hawk [1] in it, and, strange to say, its mate had been feeding it. No fewer than portions of twenty-two mice were discovered lying around it, including a number of voles, or field mice. It is alleged that the gamekeeper killed the hawk, although such proof was given of its being the farmers' friend.

Moved by this admirable letter, and by the excellent example thus set me, I also addressed the Editor of *The Times*, and by his favour the following letter was published on May 16 last:—

> Economic Ornithology, or the study of the inter-relation of birds and agriculture, and an investigation of the foods, habits, and migration of birds in relation to both insects and plants, is an untrodden and promising field that lies open for investigation by the English agricultural scientist.
>
> We are in this important matter far behind our cousins in the United States of America; their Agricultural Department in 1885–6 established a "Division of Ornithology," which, I understand, has since obtained and published, in the direction in question, very valuable and very practical information. To cite the American official report—"By publicity it was hoped to correct the ignorance concerning injurious and beneficial effects of the common birds of the country, and to prevent the wholesale destruction of useful species."
>
> To anyone who observes and thinks it is most painful to read day after

[1] Probably a kestrel (*Falco tinnunculus*), a beautiful and useful bird, never hurtful.

day such communications as that admirable letter you give us this morning "on the destruction of hawks in relation to the Scotch plague of (voles) mice." Only the other day I read—headed "Sparrow Crusade"—the members of the Epping Sparrow Club killed no fewer than 6,000 sparrows. Again I read on the 23rd of last month:—"Lord Spencer appeals to farmers to discontinue the practice of scattering poison to kill rooks; numbers of rooks and jackdaws had been picked up, and analysis showed they had been poisoned by strychnine." Such notices from the every-day Press might be multiplied *ad nauseam.*

I question whether there exists in England a scientific ornithologist who has studied economic ornithology from an agricultural standpoint. If such a one exists, I pray him to come forward, because we would gladly commission a competent scientist to write an initiatory paper on this pressing subject for the *Journal* of the Royal Agricultural Society.

I have been in communication with the head-quarters of English Ornithology, but did not obtain there much encouragement. It is most provoking to turn to the recognised text-books on ornithology, only to find vague and agriculturally useless statements such as this—"The food of this species (of birds) consists," of certain known things, "together with insects, pupæ, and larvæ." Now, economic ornithology to be of practical use should surely tell us exactly what the pupæ and larvæ are, and what, in the absence of the bird factor, the pupæ and larvæ might have become. So also in regard to the vegetable food found in the crops of common birds, economic ornithology should give agriculturists precise—that is, scientific—information.

Fully sympathising with the spirit which dictated Sir Herbert Maxwell's before-mentioned letter to you, I am moved to ask of your courtesy to allow me publicly to appeal to scientific ornithologists to help agriculture and the *Journal* Committee of the Royal Agricultural Society in regard to applied ornithology. And I would venture further to suggest to the many valuable scientific societies in the country towns of England—societies which have already produced great men—that a new and most interesting field for invaluable open-air study may be found in an agriculturally economic ornithological investigation into the habits and migrations of common English birds.

The result of some correspondence, conversation, and consideration brought me to the conclusion that, instructed by the labours of a former generation of able authors, we should hope to found a small school of Economic Ornithology, recruited from amongst the many able young men who have passed out of the various agricultural colleges, many of whom might have ornithological tastes, and all of them who have graduated in honours should have at least a competent knowledge of the elements of the essential and cognate arts and sciences, the principal of which sciences would necessarily be Entomology. Above all things we want open-air naturalists. Long ago a school of Agricultural Chemistry became essential; it produced amongst others Sir John Lawes and my late friend Dr. Voelcker. So also in regard to Agricultural Entomology: there was a void, a demand, and we have the unselfish, unsparing honorary services of Miss Ormerod, who has made this applied science her own, vastly benefited British agriculture, and has established for herself a European, a world-wide reputation.

The ornithological division of the United States Government Department has in five short years made rapid advances; and it is of the utmost importance that the carefully-placed footsteps of the division should be laboriously traced, as we ourselves, the fellow-countrymen of Gilbert White and of Thomas Bewick[1]—our English school of Economic Ornithology—must run after that of our American cousins; and happy shall we be if, handicapped as we are, we can ever in this matter overtake their energetic endeavours.

The new line of American investigation[2] in the outset leads to these conclusions; few injurious insects can be considered without reference to their liability to be devoured by natural enemies, and especially birds. Hence the inter-relation between birds and insects, a theme necessarily bearing on applied ornithology—these relations are most complicated. The interest of the farming community is especially in the food habits of birds, and food habits have intimate entomological bearings.

There is an American Ornithologists' Union, a sort of federation of natural history clubs, and much is to be gained by the State co-operating with this union. Information is obtained by the personal observation of field agents; by the co-operation of intelligent observers on the farm, in field, orchard, and forest; in the collection and analysis of stomach contents, and by the collation of already published accounts. Circulars and schedules are sent to a thousand persons, unionists and others. To secure exact data blank forms were issued, a cursory investigation of which has developed ornithological facts hitherto unsuspected. Ladies are employed in the entomological investigations. More than 1,500 bottles of stomach contents have been already obtained, for examination, analysis, and determination.

In 1887, the State Report mentions work done in the collection of facts regarding the English sparrow, a sad Transatlantic scourge; on bird migration; also, in a tabular form, a report on the food of hawks and owls. On 1,072 of these birds post-mortem examinations were held. A hawk's crop, it was found, may contain representatives of the seven primary groups—namely, a field-mouse, a sparrow, a snake, a frog, a grasshopper, an earthworm, and a snail. There were experiments also in poisoning sparrows, but they are wary birds; when without an

[1] White with his pen, Bewick with his pencil, have in England popularised ornithology.

[2] Report, 1885. I much regret that the set of the U.S.A. Reports State Agricultural Department in the library of R.A.S.E. is incomplete; I consequently could not consult the vols. for 1886–1889.—C.

obvious cause they observe a friend on his back kicking his heels in the air, they take the hint and hop off.

The Report of 1888 mentions the thousands of migrating birds annually killed by striking the various lighthouses; heads and wings are collected and forwarded to the Economic Ornithological Department.[1] There are public exhibitions of birds, each specimen labelled with habitat and food. The geographical distribution of species has also occupied much attention. To secure adequate results it is found that a great number of stomachs must be examined. Mention is made of the common crow (*Corvus Americanus*); it kills vast numbers of mice.

The fifth Annual Report, the report of 1890, mentions the publication of three illustrated leaflets (bulletins) on hawks and owls, on the common crow, and on crow-blackbirds. More than 800 stomachs were examined for the purposes of these publications.

Ornithology is still characterised in America as "this little-known field!"[2] It is said, no doubt justly, that unless illustrations are well executed it is better to do without them; and, let us note this in England, it is found in analysing the contents of birds' stomachs that a reference collection of seeds is invaluable. Mention is made of a large and increasing correspondence —4,000 specimens were sent in for identification. The collection of stomach-contents now in the department numbers 12,000 and it is daily increasing; still, the department clamours for more, because in most cases there are few representations of the food of the same species of bird taken at different times of the year.

Seed planting by birds raises questions of great novelty and interest to dwellers in the old country, and these questions in their solution will afford plenty of employment—hard nuts to crack—for our proposed English school of Economic Ornithology. All the smaller birds, according to the official report, are either insect eaters or seed eaters: it has been discovered that the seed eaters are not the seed planters: seeds which contain nourishment are eaten, and in the process are ground and destroyed: seeds which are only contained in other nourishment are swallowed and survive. It has been discovered by actual observation—so the official report says—that American crows can take in and retain for some time and finally disgorge at will anything distasteful or injurious. Hence, having swallowed

[1] I understand a committee of the British Association has been engaged for ten years in preparing a digest of observations from light-houses and light-vessels on the migration of British birds.

[2] Yet with us the science of ornithology is said to be smothered in its own literature, so wide a field must now be trodden by specialists.

berries and assimilated the pulpy part, the American crow can eject by the mouth clean and polished seeds.

The official report goes on to say there is lamentable ignorance of the various species of birds which are in the habit of ejecting by the mouth seeds taken with their food.

Turning now from new American lamps of science to furbish up old ones in England, my attention was called by an obliging correspondent to the "Report of the Wild Birds Protection Committee of the House of Commons of 1873," to be hereafter cited by me in this paper as the Commons' Committee. I question whether, in the department of science now under discussion, from that date to this any real advance has been made in England. Any way—*faute de mieux*—this Report is an admirable text-book of all that was then known of economic ornithology, a very mine of wealth in which the proposed English school of economic ornithologists could dig for precious nuggets of ornithological gold, to be afterwards added to and cast and recast and beaten out into shapes and forms demanded by the increased knowledge and exigencies of our day.

As already observed, the science of Economic Ornithology is immediately complementary to that of Economic Entomology.[1] Previously it has been well said in the new American Report, a statement anticipated in the old English Report, that: "Two kinds of life are closely co-ordinated," that is to say, bird life to a great extent exists on insect life.[2] Accordingly, I applied, in reference to this paper, to the fountain head of British Applied Entomology, and Miss E. A. Ormerod, Honorary Consulting Entomologist to the Royal Agricultural Society, to whom I am especially grateful, and to whom all agriculturists should be grateful, has favoured me with the following letter, dated June 6 last, which *in extenso* I now gladly give to my readers:—

In reply to your letter on the subject of Economic Ornithology received yesterday, I can most truly say that I believe that the spread of plain and sound information as to the habits of our common wild birds would be of great importance agriculturally.

Just noting first (in reference to your Lordship's remarks as to the study in its connection with insect crop ravages) some of the special services rendered by different kinds of birds, in neutralising different kinds of insect attacks, or attacks on special crops, I think the following summary of observations put in my hands in 1879 by Mr. F. Norgate, of Sparham, Norfolk,

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[1] It is estimated that some day nearly a million different forms will be recorded. Insects outnumber all the other members of the Animal Kingdom. They have a wonderful power of acclimatisation. Insect life may be from seven years to twenty-four hours. Metamorphosis—transformation—is a fascinating study.

[2] 273. N.B.—The numbers refer throughout to the Evidence, Commons' Committee.

gives useful suggestions for further amplification. (This is taken from my Annual Report for 1879.)

"Amongst various species of birds serviceable generally on forest trees, apple trees, and fruit bushes, Mr. Norgate mentions the titmice, including the blue, cole, marsh, long-tailed, and great tit (and of these the blue tit may be especially observed at work amongst *Aphides* on gooseberry bushes); also the warblers, woodpeckers, nuthatch, and tree-creepers. The lesser spotted woodpecker is noted as especially frequenting the apple; the gold-crested regulus frequents the Scotch pine, spruce, and other *Coniferæ*; the bearded tit, yellow wagtail, titlark, wren, cuckoo, and water rail, are mentioned as serviceable in osier beds and reeds, and in marsh hay. Amongst gooseberry, currant, and raspberry bushes the titmice and warblers, the wren, and the cuckoo are noticed as of especial use. Amongst cabbage and turnip crops the partridge, spotted fly-catcher, swifts, swallows, and martins are serviceable. . . . On grass—besides the warblers, swallow, swifts, martins, and partridges before mentioned—the wagtails, pipits, and starlings were all of service."

This just refers to a portion of what is included in my own special department, but our need of information runs far wider; we want *trust-worthily*, and *plainly*, given details of the extent to which birds (specified) injure our common field or fruit crops under common circumstances; also the extent to which they may be reckoned on as friends or foes to other kinds of birds, or *Mammalia*, or *Reptilia*, useful or hurtful to us. And also we need an authentic account of the *domestic* habits (so to say) of each kind described, such as its time of nesting, how many broods in the year, description of the position and appearance of the nest and of the eggs, and of the birds both male and female.

So far as obtaining information goes, I do not think there would be much difficulty—bird lore from the rude but extremely well-informed observation of the village urchins, who harry all the nests they can get at, up to the grave *sesquipedalia verba* notes of the "scientific ornithologist," are easily procurable—but the difficulty appears to me to lie in the working.

I am very far indeed from thinking that all the County Council Lecturers are advancing the subject most under my own notice, namely, that of Agricultural Entomology; in fact, I am aware of cases where the matter has been brought into contempt by the incapacity of the lecturer, and I greatly fear that if we added *soi-disant* teachers on bird life we should be deeper yet in the mire.

The connections of the subject need long experience to set usefully forward, and I think have to be considered often in their local social bearing. With regard to rooks, for instance, half the farmers in a parish will declare one way, half the other, about their injuriousness. My own view is that this depends very much on weather, state of land, and crop. With birds of prey, there is difficulty in working the matter *evenly*—for the rules (or laws even) suitable for regulation of wide areas of open field, moor, or forest, would come very differently on orchard growers.

In the much-vexed question of the sparrow, it is no matter what it eats in a town, but in the country I am personally aware of the fearful loss caused.

This is not only by its raids on the corn fields, but by driving away the swallows and martins, which are amongst the first class of our insect protectors.

Should the matter be brought forward, I have a large amount of evidence in my hands as to the absolute curse that this bird is (in its fostered condition) to British agriculture, and whilst I would earnestly plead for preservation of *every other of our birds*, I would give every help in my power by encouragement with my pen, and (if my much tried finances allowed) by

subscriptions to every sparrow club in the country limited to destruction of this one bird, *Passer domesticus.*

But reverting to the special matter, it seems to me that what we need most of all is a plain, sound, reference book, a "Manual of Agricultural Ornithology" well illustrated, with information such as I have already suggested.

If we could have this formed there would be a solid basis of beginning, and there are many who would be competent to compile it. I would on no account suggest that it should be weighed down either on the one hand with scientific technicalities, nor, on the other, with *contes de ma grand mère,* but I think it would meet many a difficulty soundly and well.

I wish I could offer personal assistance, but though for a long period of my life I had a deal to do with bird observation amongst the woods and wooded Severn cliffs of South-West Gloucestershire, and my sister, I might say, is an expert about birds'-eggs and nests, I could not by possibility spare the time.

I must ask you to excuse this hastily-penned letter, written, as well as I can think it out, on the spur of the moment, and should there fortunately be anything in it which you may consider serviceable, it would be only a gratification to me if you would make any use you please of it.

I cordially agree with Miss Ormerod's view that the consulting agricultural ornithologist of the future should consider most carefully all applications for advice principally in "their local and social bearings." And I further venture to think that the scientific lady's reference to sparrows, rooks, and birds of prey are admirable illustrations of that proposition—namely, the consideration of bird life in all "its local and social bearings." Any general ornithological knowledge must be specially applied.

The Commons' Committee took the evidence of thirty-eight experts, ranging from the learned Rector of Nunburnholme, in Yorkshire, Mr. Morris, and Professor Newton, the Professor of Zoology at Cambridge University, down to the cockney bird-catcher who hailed from Seven Dials. Men of science, farmers, market gardeners, including, amongst others, real out-of-door naturalists, pure and simple lovers of science, a barber, a bookseller, a picture dealer, a hair-dresser, and other tradesmen. Yet, on the question of the criminality or otherwise of the sparrow there was upon the evidence a very evenly balanced conflict of opinion. As Miss Ormerod has appeared on the other side, as the lawyers say, without prejudice, I put in a few words from the Commons' evidence in favour of that vulgar but never-failing little companion of man—for all the world over, wherever man is, there is the sparrow, strong, hardy, and prolific.[1] I willingly admit that in some localities the sparrow takes or may take the place of more useful birds; yet, to parody the old distich, it is possible that

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[1] 888.

When other birds are gone and spent,
Then sparrows are most excellent.

One witness, a large market gardener, born to the business, had, he said, "the blood of a great many sparrows on his hands"—a sparrow club—he was in consequence eaten up by blight and insects.[1] Sparrows, that market gardener found, do more good than harm;[2] they eat the larvæ of one of our greatest enemies, the green caterpillar, the ravager of gooseberry leaves. "What I lose by sparrows," quoth he, "I consider as wages paid to good servants, for ten months of the year they do good, for two months, perhaps some evil.[3] Another witness, a non-scientific man, a practical farmer in Leicestershire, had on his farm 30 acres of fruit trees. His father killed all the birds he could; the result was "we had no leaves on our gooseberry trees, and we lost our fruit entirely."[4] A Lincolnshire justice testified: "I have seen a cock sparrow hawking at the white butterfly in the sun, like a hawk after a heron; the sparrow thus kills tens of thousands of the eggs which produce the cabbage caterpillar: he takes the evil in the egg."[5]

In regard to rooks, the evidence tendered to the Commons' Committee bears out Miss Ormerod's observation—namely, that the good or evil done by these birds depends much on surrounding circumstances. A well-known Scotch farmer told the Commons' Committee that the rooks are hard on patches of laid corn: nineteen-twentieths of their food consists of insects, and very destructive ones, too—tipula grubs, crane-fly grubs, and a great many beetles. Rooks, in the witness's opinion, should be regulated but neither persecuted nor protected.[6]

Again, the Rev. F. O. Morris, a very high authority, submitted this calculation: A rook requires at least 1lb. of food in a week, and of this nine-tenths are insects and worms. A rookery of 10,000 rooks will consume in one year 209 tons of worms, insects, and their larvæ.[7]

The views expressed by my lady correspondent in regard to birds of prey, and indeed also as regard small birds, are fully borne out by the evidence taken by the Commons' Committee.

All the owls are much valued by naturalists; rats and mice are their principal food.[8] When I was a young man I remember at Thornton-le-Street plenty of white owls, such beauties, but every man's hand—or rather trigger-finger—was against them. Our ancestors, wiser than we are, always made in their great barns ingress for owls—an owl hole—with often a stone perch.[9] Passing over the effect the destruction of birds of prey has had in

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[1] 329. [2] 333. [3] 339 [4] 1742. [5] 446. [6] 1250. [7] 1201. [8] 40. [9] 1022.

causing grouse disease, and on the moorlands the serious increase of vipers,[1] we come to the kestrel, the sparrow-hawk, and the merlin, which all have their special uses; unfortunately the kestrel is becoming more and more scarce.[2] Canon Tristram, F.R.S., a witness, told the Committee, "I met the keeper of Lord Boyne, who had just killed a kestrel. I said it was a shame, it did no harm. 'Oh, sir,' he replied, 'it's varmin, they kill the partridges.' I said, 'I will give you five shillings for every partridge feather you find in the bird's crop.' We opened the cock kestrel, and I counted 178 wire worms and not a feather!"[3] The hawks, owls, and weasels on Lord Middleton's estate, Wollaton, were so kept down with pole traps, and otherwise, that as many as 1,500 rats killed per month were paid for.[4]

The text-book of Agricultural Ornithology, well illustrated as suggested by Miss Ormerod, exactly meets my views, and, indeed, I had already conversed on the subject with my colleague, who takes the chief part in our Educational department.

But further, I am about to invade the province in which the Honorary Consulting Entomologist of the Society reigns supreme, and plead with her—in the sense of encouragement and counsel—for a complementary Text-Book of Agricultural Entomology also well illustrated. Indeed, from the evidence before the Commons' Committee, such a text-book is essential to modern agricultural education. In a highly cultivated field, for example, an insect lives as it were in a larder—everything ready to its mouth, so that insect is more favourably circumstanced in regard to propagating than if, scattered over a wide area, it had to travel far and near in search of food.[5] We want information not only as to vegetarian insects, but in regard also to predaceous insects—insects that live on insects.[6] It is said some insects are distasteful to birds—social caterpillars, for example; but how about their larvæ—that may be a dainty dish to set before a bird?[7] One witness had in confinement one thousand caterpillars of the tiger-moth; they together in feeding power were computed to be equal to six rabbits or more.[8]

Miss Ormerod, by her writings and example, will assuredly be the foundress of a school of Agricultural Entomology: the study and practice of this science being absolutely essential to agriculture. Leaving cremation out of the question—insects will certainly continue to remember us long after we have forgotten them.[9]

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[1] 41. [2] 43-44. [3] 17. [4] 1565. [5] 3066.
[6] 3096-3105. [7] 273. [8] 2895.
[9] Insects are scavengers which usually follow upon a morbid or lifeless

This paper, written at the last moment, must be brought to a conclusion by a rapid review of the Commons' Committee Report, which, as I have said, I hope will be the foundation-stone of our proposed little school of Agricultural Ornithology. Like the meat of the beaver, the best is in the tail, so also in this report there is in the appendix fine literary food for inward digestion. Dr. Morris, M.D., of Nottingham, put in a table of British land birds and waders, and their food, as given by the best English authors, which, miserably inexact as it is in regard to food habits, is nevertheless invaluable, and should, in an improved and modernised form, be widely circulated. A complete list of all British ratting and mousing birds is a matter of public interest at this time, when mice [1] are rampant and rats are on the warpath.

Citing Dr. Morris and leaving the eagles, the spotted and the golden, as ratters only, we come to the kestrel (*Falco tinnunculus*), a great mouser, the goshawk, the sparrowhawk, the kite, the common buzzard (*Buteo vulgaris*), the rough-legged buzzard, the honey buzzard, the marsh harrier, the common harrier, the ash-coloured harrier, the eagle-owl (*Bubo maximus*), the scops-eared owl, the long-eared owl, the short-eared owl, the white or barn owl, the tawny owl, the snowy owl, the hawk owl, the little owl, Tengmalm's owl (*Noctua Tengmalmi*), an occasional visitor, ash-coloured shrike, red-backed shrike, woodchat (*Lanius rufus*), raven, carrion-crow, magpie, and jay. Of these two last, Mr. J. E. Harting says they destroy quantities of young field mice, systematically searching for the nests and turning them out.[2] Great bustard, great plover, crane, common heron, common bittern, white stork, landrail, and water-rail, at least one of these birds is known to have devoured a shrew-mouse (Morris). Here is a goodly list of thirty-five English mousing birds—go to the mouse-stricken districts and inquire how many of these mousing birds are known to be in existence? In all probability it will be found that man, knowing better than Nature, has improved them—or most of them—off the face of the earth.

Birds are often unduly blamed; the bite of a snail or a slug is frequently taken for that of a bird. The bird, however, always makes a sharp bite, leaving an edge; the attack of the slug or snail appears as a round cup-like wound.[3] And further, this piece of advice to young economic ornithologists I cull from the evidence,[4] but the rendering is not that of the Blue-book.

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condition; so also they are busybodies greatly occupied in the fertilisation of plants.

[1] Voles. [2] Appendix, p. 187. [3] 2898. [4] 2900.

You must be up soon after dawn, if you wish to see "the early bird get the first worm!"

The statement [1] as to the reproductive power of insects by Mr. Groom Napier, is most suggestive. He refers to the great prices given even then for wild birds' eggs, prices showing scarcity verging on extinction of species. In 1782 the South of England was ravaged by moths, the caterpillars of the brown-tail moth (*Porthesia auriflua*); the alarm was so great that prayers were offered in church.

One of the greatest friends of the farmer is the family of ichneumon flies—predaceous insects—which destructively lay their eggs in the bodies of living caterpillars. Here I must interpolate a charming passage from Gilbert White: [2]—

> "I saw lately a small ichneumon fly attack a spider much larger than itself on a grass walk. When the spider made any resistance, the ichneumon applied her tail to him and stung him with great vehemence, so that he soon became dead and motionless. The ichneumon then running backward drew her prey very nimbly over the walk into the standing grass. This spider would be deposited in some hole where the ichneumon would lay some eggs; and as soon as the eggs were hatched, the carcase would afford ready food for the maggots. Perhaps some eggs might be injected into the body of the spider in the act of stinging. Some ichneumons deposit their eggs in the aurelia of moths and butterflies.'"

To return, Mr. Napier concludes thus: an extensive diffusion of information on the habits and means of destroying our noxious insects would be a means of saving many million pounds'-worth annually of valuable food otherwise lost to the community. Could 100,000 copies of a good and very cheap work on the insects injurious to agriculture be circulated, I believe it would do much to add to the resources of the country. The United States Government is far more alive to the importance of this subject than we are. Almost every State has a Government entomologist, whose business it is to make inspections and reports of the ravages of insects, and their prevention or cure.

That learned ornithologist, the rector of Nunburnholme, handed in a connected statement which, like everything he writes on ornithology, is of the greatest interest. I regret that my space allows only of one quotation: "The rats and mice have increased to a fearful extent. Every weasel and every owl is trapped, if not shot—the farmer's very best friends. I counted no less than fifty-four of these useful animals, the stoats and weasels, nailed up on the gamekeeper's gallows-tree. The mice

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[1] Appendix, p. 169.
[2] *Natural History of Selborne*; Observations on Insects and Vermes.

too—the short-tailed field mouse—has increased in a prodigious manner. Only last year (1872) in my parish a farmer who keeps a mowing machine had to give up cutting a grass field he had undertaken to mow as he could not do it with credit, his machine getting clogged with the grass matted by the nests of the mice." I wish I could give the Rector's account of the wild birds in Mr. Waterton's Park. I myself in youth visited that old naturalist. Knowing the family, he exclaimed in my bashful presence, "Ah, ha! he is one of the old brood!" In regard to birds, Waterton summed up thus: the more you leave Nature to itself the better, except where civilisation has altered Nature's balance.[1]

Turning from the appendix with regret, and reverting to the categorical evidence, gamekeepers are much blamed for their mistaken zeal in the extermination of the sparrowhawk, the only bird that can catch a wood-pigeon—the hawk only nibbles a tit-bit, and then immediately kills another pigeon, and so on; the wood-pigeon is the natural food of the sparrow-hawk.[2] Nine-tenths of the wood-pigeons in winter are Norway bred or from the North of Scotland.[3] Canon Tristram, F.R.S., said[4] gamekeepers are very inaccurate in their observations, the most inaccurate class of men existing; any large bird with a hooked beak and claws is to him an enemy; keepers never examine crops and stomachs. Anyway, rare birds are certain to be shot down for birdstuffers and naturalists.[5] The professional bird-catchers carefully watch the March and the Michaelmas flight of birds,[6] but it is related of a gamekeeper[7] that he argued "The cuckoo turns into a hawk in the winter: leastways, what becomes of the cuckoo?"

I think myself this is rather hard on the poor keeper; he is probably neither much better nor much worse than the class whence he is drawn, if anything I should say from my own experience rather better—without book-learning, he has usually conversed with educated people, and probably to his profit he has sat down and chewed the cud of improving reflection.

Sad to say, fair ladies—gentle dames—have not escaped scatheless from the searching examination before the Commons' Committee; it seems that the mines of Golconda, the pearl fisheries of Southern Seas, the Garden of Eden with its flowers and its fruits, never forgetting the foliage, would not satisfy their insatiate desire for objects to be used in personal adornment; they have ravaged the beasts of the field, and the fowls of the air are being devastated for the purpose of obtaining heads, skins, and feathers for these sumptuary purposes. One scientific ornithologist was greatly overcome at a party on seeing a

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[1] 99. [2] 38. [3] 129. [4] 212. [5] 725. [6] 3182. [7] 105.

lady who "had the audacity" to appear in a tippet constructed with 500 robins' skins; he was only very slightly revived on learning that the deceased robins were of Spanish extraction.[1] Another ornithological witness observed with admirable precision and praiseworthy sentiment that he did not think the *moral* aspect of a lady's bonnet was improved when a stuffed robin was perched on the top of it.[2]

I am very sorry to pass over many matters of concrete interest to farmers, but, taking it as a whole, I must arrive at the general conclusions to be drawn from the evidence.

All birds have their uses to agriculturists and gardeners, but some may be too numerous: birds generally do more good than harm. Man, whenever he steps in, violates the law of natural co-ordination: there is a balance of nature, and that balance man upsets. He, with wayward fancy, breeds and plants whatever pleases him, and regards not the natural conditions of the plant or animal.[3] Insects swarm more and more because their checks do not increase in proportion, and that is entirely owing to the intervention of man. Insects are one of the greatest difficulties with which farmers have to contend: especially so where high cultivation prevails.[4] There is not a tree that grows which is not subject to attacks of its own particular familiar insect—the oak alone has no less than 50 different invading insect persecutors.[5] Birds in England, as elsewhere, are the chief means of destroying insects.[6] Generally, in regard to birds and their food habits, there is crass ignorance. Foolish unreasonable unthinking "crusades" against birds are everywhere preached; iron fences are multiplied; hedges are stubbed up; thatched roofs are no longer constructed; in consequence, nesting opportunities grow less and less, and where is the wonder the most desirable birds frequently disappear?[7]

My reference in *The Times* letter to scientific societies in county towns is amply justified in the evidence, notably in regard to the Nottingham Naturalists' Club.[8] But when I wrote to *The Times* I had in view especially my much regarded and good old friends at Thirsk; they have already produced a famous botanist. I cull the following paragraph from the *Yorkshire Herald* of the 14th of last month in reference to a meeting of the Thirsk Naturalists' Club:—

"In the absence, through indisposition, of the Vertebrate Secretary, Mr. Foggitt[9] also showed a specimen of the lesser kestrel, which had recently been

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[1] 55. [2] 729. [3] 3069.
[4] 3060. [5] 910. [6] 914.
[7] 3091. [8] 2046–1683.
[9] I am sure he did not inhospitably compass this rare bird's death.

shot near to Thirsk. This bird, a native of Eastern and Southern Europe, which nests among old ruins and in the crevices of mountain rocks, is of very rare occurrence in this country. The only other recorded example in Yorkshire is of a mature male shot by Mr. John Harrison, of Wilstrop Hall, in 1867, which is now in the York Museum. Natural history notes and observations taken by Mr. Fawcitt, and a good show of British birds' eggs by Mr. Tennant, concluded a most interesting meeting."

These naturalists' clubs of country towns, composed as they are of men devoted to science and with grand opportunities, will, I hope, federated as in America, do great things for Agricultural Ornithology.

Far too little encouragement has been given in England to specialists to study Economic Entomology. Other countries—for example, Germany, France, Switzerland, Austria, and the United States of America—are far ahead of us in scientific understanding of the enormous danger which may arise from insects, and the consequent value of small birds.[1] The French Government also found the ravages of insects had been greatly increased by the destruction of birds, and protective laws were consequently enacted.[2] One witness in my opinion very sensibly observed: "I think generally diffused information for the public would in England be more effective than any legislation."[3]

An exact and sufficient table of birds' food habits should be issued in a cheap form.[4] This is a crying want, referred to in my *Times* letter. The materials for the construction of such a table do not at present exist in England, and their collection will be the work of years. M. Florent Prevost, a Frenchman, has made in Europe the only known systematic and trustworthy observations;[5] he exhibited in the English Exhibition of 1862, preparations, showing the food of French birds.[6] Dr. Morris, M.D., said that British authors, even of great repute, scarcely allude at all to the food of birds, and when they do mention it, you have, in order to get at the facts, to pick out from half a dozen pages two lines of information.[7] The Cambridge Professor of Zoology told the Commons' Committee that very little is known in England about the way in which birds are fed.[8]

I have thus endeavoured, though I know very inadequately, to make it apparent that there is, in regard to Economic Ornithology, or the science of birds, from an agricultural point of view, a crying want, a serious void in our English practice and in our system of agricultural education, and I shall, indeed, be happy if in this matter I am, even in a slight degree, instrumental in bringing home to men's bosoms and business that knowledge of imperfection which is the first step to improvement.

CATHCART.

[1] 3094. [2] 918. [3] 312. [4] 1682.
[5] 598. [6] 599. [7] 1623. [8] 598.

Official Reports.

REPORT OF THE COUNCIL

To the Anniversary General Meeting of Governors and Members, held in the Hall of the Royal Medical and Chirurgical Society, at 20 *Hanover Square, W., on Monday, May* 23, 1892.

The Council have to report the following changes in the List of Governors and Members during the year which has elapsed since the last Anniversary Meeting in May 1891 :—9 new Governors (including H.R.H. Prince George of Wales, K.G.) and 802 Members have joined the Society, 10 have been reinstated under Bye-law 12, and 9 Members have qualified as Governors; whilst the deaths of 1 Annual Governor, 14 Life-Governors, 2 Honorary Members, 203 Annual Members, and 101 Life Members have been reported. A total of 22 Members have been struck off the books under Bye-law 10, owing to absence of addresses, and 108 under Bye-law 11, for arrears of subscriptions; whilst 253 have resigned.

2. The untimely death of H.R.H. the late Duke of Clarence and Avondale—felt by all classes of Her Majesty's subjects as one of the saddest calamities that have ever befallen Her Majesty the Queen and the nation at large—was a cause of peculiar sorrow to this Society, of which His Royal Highness was a Member, as well as to the whole of the great agricultural community, with whose interests the Royal Family have always identified themselves. At the February meeting of the Council, it became their melancholy duty to give expression to the common grief by the presentation, in the name and under the seal of the Society, of humble and loyal addresses of condolence to Her Majesty the Queen and Their Royal Highnesses the Prince and Princess of Wales in their painful bereavement. Both addresses have been very graciously received and acknowledged.

3. By the death of the Duke of Devonshire the Society has lost its oldest Vice-President, and one who has rendered important services to the Society in the past. The late Duke joined the English Agricultural Society as Governor so early as 1838; and was thus an original Member of the Royal Agricultural Society of England. In 1867 he was elected a Member of Council and

in 1869 a Vice-President, which office he held to the time of his death. In 1869–70 he served the office of President, retiring after the second Oxford Meeting. His Grace was a scientific man of great distinction and remarkable gifts; but to English agriculturists he was best known for his successes as a breeder and improver of Shorthorn cattle.

4. The Council have also to deplore the deaths of two of the Honorary Members of the Society, the Right Honourable Sir James Caird, K.C.B., who had been associated with the Society for over forty years, and Professor Hofmann, of Berlin, who was, with the exception of Sir Lyon Playfair, the oldest Honorary Member of the Society, having been elected so long ago as March 4, 1846.

5. Amongst the Governors and Members of the Society who have died since the last report are the Earl of Charlemont, K.P., the Earl of Denbigh, Viscount Hampden, G.C.B., the Earl of Leitrim, Sir A. Acland Hood, Bart., Sir George Jenkinson, Bart., Sir William Russell, Bart., General Sir G. H. Walker, Bart., Sir T. Whichcote, Bart., Mr. W. J. Beadel, M.P., Mr. F. A. Hankey, M.P., Mr. Robert S. Holford (Foundation Life-Governor), Col. Windsor Parker (a Member since 1843), Mr. W. H. Punchard, Mr. Francis Sherborn, Mr. James Smyth and Mr. John Tench (Members since 1842), Mr. Henry Wardle, M.P., and Mr. R. E. E. Warburton and Mr. James Weston (Members since 1841).

6. These and other changes bring the total number of Governors and Members now on the Register to 11,050, divided as follows:

27	Foundation Life Governors (Members elected before the granting of the Charter on March 26, 1840);
69	Governors paying an annual subscription of 5*l.*;
84	Life Governors who have compounded for their annual subscriptions;
7,066	Members paying an annual subscription of 1*l.*;
19	Members who, having paid annual subscriptions for 50 years, have become Life Members;
3,693	Life Members who have compounded for their annual subscriptions;
72	Life Members by Examination;
20	Honorary Members.
11,050	Total number of Governors and Members;

or a net increase of 122 Members during the year.

7. To fill the vacancy caused by the death of the Duke of Devonshire, Viscount Emlyn has been appointed a Vice-President, and the Duke of Westminster, K.G., has been elected to the vacant seat upon the Council.

8. The accounts for the year 1891 have been examined and certified by the Auditors and Accountants of the Society, and were

published in the last number of the Journal. The final results of the working of the year are, that after writing off the customary percentages for depreciation, the Society's assets amounted at December 31, 1891, to 34,934*l.* 11*s.* 6*d.*, as against 35,176*l.* 13*s.* 2*d.* at the end of 1890. The Council regret to report the resignation and subsequent death of Mr. Francis Sherborn, the Society's Senior Auditor. Under the bye-laws, the election of a new Auditor cannot take place until the General Meeting to be held in December next.

9. At the Show of Horses which was held at the Royal Agricultural Hall last March, under the auspices of the Royal Commission on Horse Breeding, of the Hunters' Improvement and Hackney Horse Societies, and of this Society, the Society's three Premiums of 200*l.* each (with Gold Medals provided by the Warwick Local Committee), for Thoroughbred Stallions serving mares in District F during the present season, were awarded to Mr. E. G. Crowhurst's *Just-in-Time*, Lord Tredegar's *Lord Molynoo*, and Mr. J. C. Harford's *Rameses*. These stallions, which will be exhibited at the Society's Country Meeting at Warwick from the morning of Monday, June 20, to the evening of Wednesday, June 22, are located for the season as follows :—*Just-in-Time* at Leamington ; *Lord Molynoo* at the Stud Farm, Coedkernew, near Newport, Mon. ; and *Rameses* at Ludlow, Leominster, and Hereford. The Council consider that the time has now arrived when these premiums should be provided for the whole of the country by the Royal Commission on Horse Breeding, and they have therefore resolved to discontinue the grant of 600*l.*, which for the last few years they have annually given for this purpose.

10. After two unavoidable postponements, in consequence of the severity of the weather, the trials of ploughs in connection with the forthcoming Warwick Meeting were duly held from March 21 to 26 last upon light and heavy land in the neighbourhood of Warwick. The following were the awards of the Judges :—

CLASS I.—*Single-furrow Ploughs for Light Land.*
(13 entries, 11 competing.)

FIRST PRIZE (£10) to W. BALL & SONS, Rothwell, Kettering, for No. 1.
SECOND PRIZE (£5) to THOMAS CORBETT, Shrewsbury, for No. 4.

CLASS II.—*Single-furrow Ploughs for Heavy Land.*
(11 entries, 8 competing.)

FIRST PRIZE (£10) to W. BALL & SONS, Rothwell, Kettering, for No. 14.
SECOND PRIZE (£5) to JOHN PERKINS & SONS, Lichfield, for No. 22.

CLASS III.—*Single-furrow Ploughs, best adapted for a Press Drill and Broadcast Sowing.*
(8 entries, 7 competing.)

FIRST PRIZE (£10) to THOMAS CORBETT, Shrewsbury, for No. 27.
SECOND PRIZE (£5) to J. C. & T. YATES, Doncaster, for No. 32.

Class IV.—*Two-furrow Ploughs.*
(8 entries, all competing.)

First Prize (£10) to W. Ball & Sons, Rothwell, Kettering, for No. 33.
Second Prize (£5) to J. C. & T. Yates, Doncaster, for No. 40.

Class V.—*Three-furrow Ploughs.*
(4 entries, 3 competing.)

First Prize (£10) to J. C. & T. Yates, Doncaster, for No. 44.
Second Prize.—Not awarded.

Class VI.—*Digging Ploughs for Light Land.*
(10 entries, 9 competing.)

First Prize (£10) to Thomas Corbett, Shrewsbury, for No. 48.
Second Prize (£5) to J. C. & T. Yates, Doncaster, for No. 54.

Class VII.—*Digging Ploughs for Heavy Land.*
(9 entries, 6 competing.)

First Prize (£10) to John Perkins & Sons, Lichfield, for No. 62.
Second Prize (£5) to Thomas Corbett, Shrewsbury, for No. 57.

Class VIII.—*One-Way Ploughs.*
(9 entries, 7 competing.)

First Prize (£10) to Davey, Sleep, Harris & Co., Plymouth, for No. 67.
Second Prize (£5) divided between { Davey, Sleep, Harris & Co., Plymouth, for No. 68. / Eddy & Sons, Kennford, Exeter, for No. 69.

In accordance with the regulations, all the competing ploughs will be exhibited together in the Warwick Showyard. The official report of the trials will appear in the Journal (see page 306).

11. The preparations for the Country Meeting at Warwick next June are well advanced. The total amount of space allotted in the Implement Department is 12,511 feet run, exclusive of open ground space, as compared with 12,473 feet at Doncaster last year, 9,078 feet at Plymouth in 1890, 15,602 feet at Windsor in 1889, 10,743 feet at Nottingham in 1888, and 8,217 feet at Newcastle in 1887. The total entries of livestock are 1,872, as compared with 2,240 at Doncaster, 1,769 at Plymouth, 4,014 at Windsor, 1,875 at Nottingham, and 1,833 at Newcastle. There are 449 entries of horses, 607 of cattle, 600 of sheep, 14 of goats, and 202 of pigs, besides 835 of poultry, 70 of cheese, and 162 of butter. The names of the Judges in the several departments were published in the last number of the Journal.

12. Fifty-three candidates have entered for the competitions of Butter-makers for the Society's Prizes and Certificates, to take place in the Showyard, from Tuesday, the 21st, to Friday, the 24th June. Twenty-nine shoeing-smiths practising in the Society's District F (*i.e.* the counties of Gloucester, Hereford, Monmouth, Salop, Stafford, Warwick, Worcester, and South Wales) will compete for the Prizes offered for shoeing Roadsters and Dray Horses.

13. The Implement Yard and the Dairy will be open to Members of the Society and the public on Saturday, June 18, when the

charge for admission to non-members will be 2*s*. 6*d*. The judging will take place in all the classes on Monday, June 20, when the charge for admission will be 5*s*. On Tuesday and Wednesday the charge for admission will be 2*s*. 6*d*. each day; and on the last two days, Thursday and Friday, it will be 1*s*. each day.

14. The Council have already reported the receipt of invitations from the authorities of Chester and Manchester for the holding of the Society's Country Meeting of 1893. Both cities sent influential deputations in support of their respective claims on February 3 last, when the choice of place of the Country Meeting for next year came up for final decision. After duly considering the arguments of both deputations and the Report of the Committee of Inspection appointed to examine the sites and other accommodation offered by each locality, the Council determined by twenty-one votes to twenty in favour of Chester, where the Country Meeting of 1893 will accordingly be held. Its agricultural importance and convenience of access for Cheshire, Lancashire, and North Wales render the city of Chester an admirable centre for the Society's district, and sanguine anticipations are entertained of a very successful Meeting.

15. In connection with the Chester Meeting of 1893, the Council have resolved to allocate the sum of 5,000*l*. in prizes for live stock, poultry and produce, and to offer three prizes of 50*l*., 30*l*., and 20*l*. respectively for the best Self-Binding Harvester, using other binding material than wire. The trials of Harvesters will take place during the harvest of 1893, on land selected by the Society, in the neighbourhood of Chester, and the last day for receiving entries will be Saturday, April 1, 1893, which is also the date for the closing of the ordinary Implement entries.

16. As the Chester Meeting of 1893 will have completed a second series of Meetings under the scheme for the rotation of districts revised in 1878, the Council in March last appointed a Special Committee to consider the advisability or otherwise of making any changes in the present arrangement. This Committee has now reported (see page 363), and as the result of its deliberations the Council have determined to continue the existing rotation and division of the counties, but to make the Metropolis, and the large provincial cities of Birmingham, Liverpool, and Manchester, ex-territorial so far as the geographical distribution of the Society's districts is concerned.

17. Under this plan, therefore, the Country Meeting of 1894 will be held in District A, comprising the counties of Bedford, Buckingham, Cambridge, Essex, Hertford, Huntingdon, Middlesex, Norfolk, Oxford, and Suffolk; and the localities of the Country Meetings for the succeeding eight years have provisionally been settled as follows:

1895	At Birmingham.
1896 District B.	Some town in Cumberland, Durham, Northumberland, or Westmoreland.
1897 District C.	Some town in Derby, Leicester, Lincoln, Northampton, Notts, or Rutland.
1898	At Liverpool or Manchester alternatively.
1899 District D.	Some town in Berks, Cornwall, Devon, Dorset, Hants, Kent, Somerset, Surrey, Sussex, or Wilts.
1900 District E.	Some town in Yorkshire.
1901 District F.	Some town in Gloucester, Hereford, Monmouth, Salop, Stafford, Warwick, Worcester, or South Wales.
1902 District G.	Some town in Cheshire, Lancashire, or North Wales.

The advantages expected from this arrangement are that the important and populous cities of Birmingham, Liverpool, and Manchester will come into the rotation every third or fourth year, and there will thus be a reasonable prospect of securing financial surpluses, whilst giving a better chance for ordinary towns in the districts to send invitations without bringing into competition the more important and populous places.

18. The Council have appointed as Provincial Veterinary Surgeons of the Society, Mr. Joseph H. Carter, of Burnley, in the room of Mr. J. B. Polding, deceased, and Mr. Thomas Horton, of 20 Jury Street, Warwick, in the room of Mr. Osborn Hills, deceased.

19. The Examiners on the Diseases of Animals of the Farm other than the Horse, in the examinations for the diploma of the Royal College of Veterinary Surgeons held last year, have reported that the following gentlemen attained the greatest distinction :—

1. Mr. G. H. Williams, Riverside, West Drayton.
2. Mr. M. T. Sadler, Burton-on-Trent.

The Society's Silver Medal has therefore been awarded to Mr. Williams, and the Bronze Medal to Mr. Sadler.

20. The outbreak of Foot and Mouth Disease in this country, which first manifested itself in the London Cattle Market early in February last, gave serious cause for apprehension, but owing to the energetic measures of the Board of Agriculture for the localisation and suppression of the disease, there is reason to hope that its consequences have been reduced to a minimum, and that its total eradication from this country will be shortly effected.

21. It is satisfactory to be able to state that in regard to other Contagious Diseases of Animals the country is in a better position than it has been for many years. During the first quarter of the present year there have only been fifteen fresh outbreaks of pleuro-pneumonia in this country as compared with forty-seven in the corresponding quarter of 1891. The disease has for some time been confined to the Metropolitan Police District, Midlothian, and part of the West Riding of Yorkshire. Of Swine Fever there have been 408

outbreaks during the last quarter. Last year there were 864 in the corresponding period.

22. In the Department of Comparative Pathology and Research, at the Royal Veterinary College, important investigations have been carried on with reference to foot-rot in sheep, tuberculosis, fatty disease of the liver in lambing ewes, and poisoning of swine by salt food, with symptoms closely allied to those of swine fever. Experiments have been continued with the view of elucidating some obscure phases in the life history of the lung-worm.

23. From December up to the end of April, 664 samples have been submitted by Members to the Consulting Chemist for analysis. The plan of publishing in the quarterly numbers of the Journal the reports of the Chemical Committee enables Members to be kept acquainted from time to time with the most general forms in which adulteration of feeding stuffs and manures occurs, besides giving notes of guidance and advice to purchasers.

24. At the Woburn Experimental Farm a series of feeding trials upon bullocks and sheep has been in progress during the winter months. In other directions, the feeding values of earth-nut cake and of malt as a partial substitute for barley have been the subjects of investigation. The usual field experiments are being continued, and one on green-manuring will be added this year.

25. It appears from the Reports of the Consulting Botanist that more samples of seeds for pasture have been examined during the past season, and that, while generally of good quality, more impurities than previously have been noticed in samples of clover as well as in those of some grasses. Inquiries have been made into diseases affecting wheat, turnips, and potatoes. The treatment of weeds in pastures has been dealt with. Mr. Carruthers has supervised for the Society the preparation of a series of eight valuable coloured Diagrams illustrating the Life History of the Wheat Plant, which have now been published by the Society's agents, Messrs. W. and A. K. Johnston, 5 White Hart Street, Warwick Lane, E.C., at the price of 10*s.* per set, including an explanatory pamphlet.

26. In view of the necessarily inconclusive nature of the experiments undertaken last year at the request of the Board of Agriculture for the purpose of determining the efficacy of sulphate of copper as a remedy against the potato disease, a fresh series of experiments in different localities throughout the country has been inaugurated during the present season; and an entirely independent experiment with the same and similar mixtures is also being made at the Society's Experimental Farm at Woburn.

27. The work of the Entomological Department has been continuing as usual with regard to crop attacks generally; and the number of applications as to the means of gaining and of imparting

information of methods of life, and means of prevention of crop-insects and their ravages, has steadily increased. Amongst special crop attacks, the reports sent in as winter advanced regarding the ultimate results of the presence of diamond-back moth caterpillars on turnips, showed that much less harm had been done than was at one time anticipated. Amongst spring attacks, Miss Ormerod reports—what is somewhat remarkable—that up to the last fortnight she had scarcely received a single application regarding insect infestation in young wheat plants : but during the last few days notes have come in of bad attack of Daddy Longlegs grubs on young corn plants, and of presence of other attacks. The question of risk to the coming crop from sowing field-beans injured by the bean-seed beetle has been brought forward, and Miss Ormerod has suggested the desirableness of refusing to take broad-beans for seed where they are much perforated, or infested, or that, if only moderately attacked, the seed should be so dressed as to destroy the insects within. At present, attack of the *Sitones*, the very small weevils which devour pea and clover leafage, is unusually severe in various localities. Attack on fruit bushes, as currant, raspberry and gooseberry, is beginning to require attention, and from one locality specimens have been received of apple twigs coated over for inches in length with aphis eggs. There have been more colonial applications than usual during the past few months.

28. The Text Book, "Elements of Agriculture," to which reference was made in the last Report, was published on January 1, 1892, and the rapidity with which the first two editions were sold out has afforded gratifying evidence of the value of the book as supplying a manifest need. The third edition is now in course of sale, and preparations are being made for the issue of a fourth and revised edition when called for.

29. Twenty-eight candidates entered and 20 actually competed in the Society's Senior Examinations, held from the 10th to the 14th of this month. The answers of the candidates are now under the consideration of the Examiners, and the results (see page 353) will be announced at the meeting of the Council to be held in June.

By Order of the Council,

ERNEST CLARKE,
Secretary.

QUARTERLY REPORT OF THE CHEMICAL COMMITTEE.

June, 1892.

1. Mr. R. W. Burchnall, of Branston, Lincoln, sent on January 18, 1892, a sample of linseed-cake which he had bought as "95 per cent. pure," at 9*l*. 12*s*. 6*d*. per ton, less 5*s*. for cash in one month.

After analysis, the following report was given :—

January 22, 1892.

Moisture	12·70	100·00
Oil	12·90	
[1] Albuminous compounds (flesh-forming matters)	29·31	
Mucilage, sugar, and digestible fibre	29·69	
Woody fibre (cellulose)	8·80	
[2] Mineral matter (ash)	6·60	
[1] containing nitrogen	4·69	
[2] including sand	1·65	

A cake largely adulterated with rape seed.

The vendors deducted 1*l*. per ton, and Mr. Burchnall was unwilling to give further particulars.

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2. Mr. J. J. Rodenhurst, of Preston Hall, Preston Brockhurst, Shrewsbury, sent on April 21, 1892, a sample of what he described as "Linseed-cake," which cost 8*l*. per ton in Liverpool. Dr. Voelcker, noticing a suspicious appearance about the cake, wrote at once to Mr. Rodenhurst, advising him to delay using the cake until the report upon it was received.

In reply, Mr. Rodenhurst said that he had not used any of the cake, but that it was only a sample taken before purchasing.

After analysis the following report was given :—

April 28, 1892.

Moisture	9·88	100·00
Oil	13·07	
[1] Albuminous compounds (flesh-forming matters)	27·37	
Mucilage, sugar, and digestible fibre	31·07	
Woody fibre (cellulose)	10·82	
[2] Mineral matter (ash)	7·79	
[1] containing nitrogen	4·38	
[2] including sand	2·11	

J. J. Rodenhurst, Esq. April 28, 1892.

Dear Sir,—I send you the analysis of the cake which is termed *Linseed*-cake. I am glad to hear that you have not purchased any of it, for it is not only a grossly adulterated cake, which ought not to be called *Linseed-cake* at all, but it contains a large amount of castor-bean, which, if given to stock, will almost surely prove fatal to them. It contains, in addition, many

other impurities in the form of foreign seeds, and such a cake ought on no account to be used as a feeding material.—Yours faithfully,

J. AUGUSTUS VOELCKER.

On being asked for further information, Mr. Rodenhurst wrote as follows :—

Dr. J. A. Voelcker. May 12, 1892.

DEAR SIR,—I have filled in the particulars as far as I can. I don't care to disclose the name of vendor as he is a good customer for barley, and I have done a good deal of business with him, and have had no fault to find up to now.—Yours faithfully, JNO. J. RODENHURST.

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3. A London firm of land agents sent on April 26, 1892, on behalf of one of their clients, a sample of linseed-cake which the latter had ordered from a local dealer. A verbal order had been given for "linseed-cake." Upon the agents paying a visit to the estate, their attention was directed to the cake, and they forwarded a sample to Dr. Voelcker for analysis. The following report was given :—

May 4, 1892.

Moisture	10·77	100·00
Oil	8·35	
[1] Albuminous compounds (flesh-forming matters)	25·37	
Mucilage, sugar, and digestible fibre	37·02	
Woody fibre (cellulose)	9·33	
[2] Mineral matter (ash)	9·16	
[1] containing nitrogen	4·06	
[2] including sand	3·99	

Grossly impure, being full of rape and other foreign seeds, and with 4 per cent. of sand.

On further inquiry, it was found that the cake, though charged at 9*l.* a ton, was simply invoiced as "Oil-cake."

The above case shows how necessary it is not only to stipulate for *linseed*-cake being supplied, but also to see that there is a *written* guarantee to that effect, and that the cake is described on the invoice as *linseed*-cake, and not merely as *oil*-cake.

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4. Mr. James Peart, potato salesman, 32 and 33 Great Northern Railway Potato Market, King's Cross, sent on March 28, a sample of artificial manure which was stated to be good for potatoes, &c., and cost 5*l.* per ton.

The following was the result of the analysis :—

April 5, 1892.

Moisture	19·69	100·00
[1] Organic matter	30·08	
Phosphate of lime	·78	
Carbonate of lime, &c.	47·27	
Sand	2·18	
[1] containing nitrogen	1·70	
equal to ammonia	2·06	

Nearly one-half of this is carbonate of lime (chalk); it has little intrinsic worth, and *5l.* a ton is an extravagant price for it. It is not at all a suitable potato manure.

No further particulars could be obtained.

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5. The following case is an illustration of the need of precaution in purchasing very finely ground bone-meal.

The finer portions of the meal obtained after grinding and sifting frequently contain very much higher percentages of fine sand and dirt than the coarser kinds. The sand is not actually added by way of adulteration to bone-meals, but is separated out from the coarser, and retained to a greater extent in the finer portions during the process of sifting; hence the finer meals are often of inferior quality. Although rightly sold at a lower price in consequence, the very fine meals ought not to be described as "pure."

Mr. E. W. Turnor, of The Green, Stafford, sent, on April 18, a sample of bone-meal, 15 tons of which, he stated, had been sold to him as "pure, raw, ground bone-meal," at *5l.* per ton on truck at Liverpool, less $2\frac{1}{2}$ per cent. discount.

The following analysis was returned:—

	April 23, 1892.	
Moisture	7·55	100·00
[1] Organic matter	24·35	
Phosphate of lime	45·49	
Carbonate of lime, &c.	7·79	
Insoluble siliceous matter	14·82	
[1] containing nitrogen	3·03	
equal to ammonia	3·67	

This is not pure, as it has a great deal of sand with it. But you would never get raw bone-meal (pure) at *5l.* per ton now. Still, this ought not to be sold as "pure bone-meal."

The vendors guaranteed the bone-meal to be "pure, and to contain at least $4\frac{1}{2}$ per cent. of ammonia and 50 per cent. of phosphate of lime." They offered to take the meal back if a fresh sample drawn showed results below the guarantee. Ultimately an allowance of *2s. 6d.* per ton was offered and accepted.

During the quarter the Departmental Committee on Fertilisers and Feeding-stuffs appointed by the Board of Agriculture applied to the Council for information respecting the action which has been taken by the Society for the repression of adulteration of manures and feeding-stuffs. The Chemical Committee, to which this request was referred, accordingly drew up the following memorandum, which with the approval of the Council, has been forwarded to the Departmental Committee, and is now included in the usual Quarterly

Report, with a view to publication for general information in the Journal :—

MEMORANDUM PREPARED BY THE CHEMICAL COMMITTEE ON THE ACTION TAKEN BY THE SOCIETY FOR THE REPRESSION OF ADULTERATION OF MANURES AND FEEDING-STUFFS.

Since the year 1849, the Royal Agricultural Society of England has annually made a considerable grant from its funds for the purpose of enabling its members to obtain, at a low rate, analyses of manures, feeding-stuffs, and other substances used in connection with agricultural operations. It has thereby assisted its members with advice as to their purchases, and has helped to protect them from the practice of adulteration.

The records of the number of analyses made during the earlier part of the period of forty-two years which has since elapsed have not been preserved; but since 1865 the number of analyses made for members by the Society's Consulting Chemist has been for each year as under :—

1865	312	1879	1,018
1866	335	1880	1,201
1867	341	1881	1,058
1868	432	1882	1,403
1869	465	1883	1,453
1870	580	1884	1,628
1871	730	1885	1,587
1872	652	1886	1,581
1873	670	1887	1,559
1874	645	1888	1,570
1875	704	1889	1,436
1876	720	1890	1,447
1877	642	1891	1,358
1878	724		

The large increase after 1878 is accounted for by the fact that at the beginning of 1879 the Society established a laboratory of its own, and at the same time greatly reduced the fees charged to members for the analyses, in most cases to one-half of their former amount.

At first the action of the Consulting Chemist was confined to the giving of private advice to such members as sent samples for analysis, and to the publication of an annual report to the Chemical Committee upon the more general adulterations which had come under notice during the year.

In consequence of the frequent occurrence of adulteration of feeding-stuffs and manures, as brought to light in the reports of the Consulting Chemist, the Council of the Society decided, on July 7, 1869, at the instance of the late Lord Lichfield, that a quarterly report on the various samples of adulterated manures and feeding-stuffs, forwarded by members of the Society, should be presented by the Consulting Chemist to the Council, and that this

report, together with the names of the dealers who supplied the respective substances, should, if the Council thought fit, be published in the Society's Journal and in the agricultural newspapers.

It is undeniable that much benefit to the farming community has followed this action of the Council ; but at the same time it has exposed the Society to a certain amount of risk, as instanced in the cases at law which it has been called upon to defend. In addition to this, great difficulty has been experienced in the majority of cases by the unwillingness of members to give the full particulars relating to the different transactions.

For tho guidance of its members, the Society has from time to time issued directions for the purchase of manures and feeding-stuffs, and these are published in each number of the Journal. These directions set out the guarantees of composition and quality under which materials, when able to be defined, should be bought. The Society has also issued for the use of members, forms of contract which it has recommended to be signed by the contracting parties in cases of purchase of feeding-cakes, so that the purchaser may be armed with a written guarantee according to the Society's standard.

In addition, in the quarterly reports of the Chemical Committee, notes of warning as to current adulterations and of advice as to precautions that should be taken in the purchase of particular materials have been given, and this system has been continued throughout.

The experience of the Society has, however, been, that agriculturists have not sufficiently availed themselves of the advantages which membership conveys, nor, if already members, of the benefits the chemical privileges offer.

The Chemical Committee feel confident that when members take the precaution of obtaining a guarantee in accordance with the terms laid down for the guidance of purchasers, there is little or no difficulty in obtaining a genuine article, or in obtaining redress in case of a deficiency of quality.

The great difficulty that has been experienced is that of securing to members that their purchases shall be made under definite descriptions, and that the invoices shall clearly describe the article purchased, in terms which admit of no doubt as to their meaning.

This is well illustrated by the term "linseed-cake." It was for a long time maintained that under this name might be sold the residue left after the expression of the oil from seed not necessarily linseed only, but from what was known in the trade as "linseed as imported." Such seed was admitted to contain admixture of various kinds, much inferior to linseed, and might even contain materials of an injurious nature.

The Society for many years carried on a struggle against this practice, and it may be said that in great measure owing to its action in counselling its members to insist on having "pure linseed-cake" only, and to see that the invoices described the cake as such, as also by the repeated publication (with vendors' names) of cases where impure cakes were sold under the name "linseed-cake," the

Society has now succeeded at length in getting the use of the term confined to *pure* linseed-cake.

In the only case between the Society and a manufacturer brought to a definite issue in the Courts (Kidd *v.* R. A. S. E., reported in the Journal for 1872, Vol. VIII. pp. 471–685), Mr. Justice Blackburn expressed a very decided opinion that to sell under the name of "linseed-cake" any cake not made entirely from linseed was to perpetrate a fraud; and the result of that action was that at a meeting of the seed-crushers and cake merchants of Hull, held in August, 1872, a resolution was passed, "That no other cakes than pure linseed-cakes shall be sold or described as 'linseed-cakes.'"

Within the last few years the Society has given a definition of what linseed-cake should be, and this has been generally accepted by the trade; so much so, that several firms openly state their willingness to give a guarantee in accordance with the Society's definition.

The passing of the Merchandise Marks Act has also helped the action of the Society, in that, although neither feeding-stuffs for cattle nor manures have been definitely brought under it, yet a general understanding among manufacturers and traders in such articles has been arrived at as to what shall be conveyed by certain definable terms, such as linseed-cake, dissolved bones, &c., these meanings being practically those laid down by the Royal Agricultural Society. Linseed-cake, for instance, now means pure linseed-cake, and cakes not conforming to this description are known by the general term "oil-cake."

The general feeling of the Chemical Committee on the matter is that there are ample means at the present time for the purchaser to protect himself against fraud if he will but avail himself of the advantages which are offered to him.

Manufacturers and traders of good repute are, as a general rule, quite willing to give guarantees of the materials that they sell, and if purchasers insisted upon having these there would be but little difficulty.

Where adulteration does take place, it is almost invariably when purchasers do not obtain written guarantees as to the materials they buy, and when it is known that they take no steps to have their purchases analysed.

Even the giving of a guarantee of analysis would not in itself constitute a security that the purchaser received his "money's worth," for a guaranteed analysis may be given and yet the material be extravagantly dear. Unless the purchaser have the material analysed, and receive the opinion of a competent person upon it, he might still be defrauded as much as before.

The Chemical Committee are of opinion that the existing organisations of agricultural societies which have analytical chemists attached to them afford ample security for the purchaser who will avail himself of the advantages such societies afford, and that legislation is not likely to benefit greatly those who will not protect themselves.

Nevertheless, there are a few points in respect of which the Chemical Committee consider it might be desirable for a general understanding to be arrived at—if necessary, by further legislation.

1. It would be an advantage alike to agriculturists, the trade, and to agricultural chemists if a definite agreement were arrived at as to what meaning is to be conveyed when certain names are applied to feeding-stuffs and manures, the nature and composition of which it is quite possible to define. Thus, it would be well that certain articles in common use on the farm, such as linseed-cake, bone-meal, nitrate of soda, &c., should be defined.

2. When a vendor sells any such articles, he should be compelled to give the purchaser an invoice describing the article by a definite name, the meaning of which is clearly understood by the trade and by agricultural chemists in agreement.

3. As, however, there are other materials, which it is not possible to define clearly—*e.g.*, substances such as barley-manure, turnip-manure, mixed feeding-cake, calf-meal, &c.—these should be sold according to analysis, and the analysis, or rather the guaranteed portion of it, should be stated on the invoice. The Chemical Committee does not regard it as necessary that the manufacturer or vendor should be compelled to state of what such materials are composed, provided the analysis be given.

4. It should be a necessary stipulation in the case of sale of all feeding-stuffs for cattle that they be understood to be "fit for feeding purposes."

5. It would be only fair to the vendor of any material that, when a purchaser intends to take a sample of it for the purpose of having it analysed, notice should be given to the vendor, so that he might attend either personally or through a representative, and see the sample drawn, or take it and others conjointly with the purchaser.

May 31, 1892.

R. A. Warren,
Chairman.

REPORT OF THE EDUCATION COMMITTEE ON THE RESULTS OF THE SENIOR EXAMINATION, 1892.

The Committee have to report that twenty-eight candidates entered, and twenty actually competed, at the Society's Senior Examinations, which took place from the 10th to the 14th of May last, and that of these twenty competitors ten have satisfied the Examiners.

2. The following eight candidates, placed in order of merit, have gained first-class certificates with the Life Membership of the

Society, the first four being entitled in addition to the prizes stated below :—

1. John Campbell, The University, Edinburgh. *First Prize of* 25*l.*
2. Thomas Askew Coward, The University, Edinburgh. *Second Prize of* 15*l.*
3. John Jenkinson, Royal Agricultural College, Cirencester. *Third Prize of* 10*l.*
4. Walter E. Coates White, The Agricultural College, Aspatria, Carlisle. *Fourth Prize of* 5*l.*

5. Percy Hedworth Foulkes, The University, Edinburgh.
6. Joseph Bisset, 22 Orford Street, Chelsea, S.W.
7. Edwin Alexander Fulton, The University, Edinburgh.
8. Arthur Noël Joseph Whitley, Royal Agricultural College, Cirencester.

3. The following candidates, having passed in Agriculture and in three of the four other compulsory subjects, are entitled to second-class certificates :—

9. George Bowman, Upleatham R.S.O., Yorkshire.
10. Martin Hammond Ward, The Agricultural College, Aspatria, Carlisle.

4. Of the compulsory subjects, there were eight failures in Agriculture, seven in Chemistry, four in Book-keeping, seven in Land Surveying, and three in Agricultural Engineering. Of the optional subjects, there were six failures in Botany, three in Anatomy, and one in Agricultural Entomology. There were no failures in Geology.

5. Taken as a whole, the results of the Examination appear to be satisfactory, though there are still some points in which the teaching given to the candidates is susceptible of improvement. Thus the Examiner in Agricultural Engineering urges greater attention to drawing, and the Examiner in Anatomy and Animal Physiology regrets that the students' "knowledge of Anatomy and "Animal Physiology is derived in a great measure from the study "of works relating chiefly to the human subject. Whether this "may be partly due to the instruction given by the science "teacher, or depend principally on the students' reading, is difficult "to determine; but, whatever may be the cause, it is much to be "regretted. It should ever be borne in mind that the object of "acquiring a knowledge of Animal Anatomy and Physiology is that "the candidates for examination should be well acquainted with the "structure and functions of the several organs of domestic animals, "especially those which may be said to be daily under their care, as "'the Animals of the Farm.'"

6. The following Table gives the marks assigned by the Examiners to the work done by each candidate in the several subjects :—

Name of Candidate	Age of Candidate	Agriculture, *max.* 300	Chemistry, *max.* 200	Book-keeping, *max.* 200	Land Surveying, *max.* 200	Agrl. Engineering, *max.* 200	*a.* Botany, *max.* 100	*a.* Geology, *max.* 100	*a.* Anatomy, *max.* 100	*a.* Agrl. Entomology, *max.* 100	Total Marks	Result
*Bisset, J. . .	29	170	142	105	122	138	67	90	60	75	969	6th
†Bowman, G. . .	37	180	+	160	126	136	+	59	+	60	721	9th
*Campbell, J. . .	27	205	153	170	175	166	73	90	75	100	1,207	1st
+ . . .	32	+	112	+	121	174	55	—	—	50	+	+
+ . . .	28	+	+	+	+	110	+	—	—	75	+	+
*Coward, T. A. .	24	175	170	165	147	148	68	77	75	75	1,100	2nd
+ . . .	24	190	+	160	116	+	+	66	+	+	+	+
+ . . .	27	167	+	+	+	130	50	50	55	75	+	+
*Foulkes, P. H. .	21	200	146	200	100	174	54	—	—	100	974	5th
*Fulton, E. A. . .	20	175	123	130	130	160	50	—	—	75	843	7th
+ . . .	23	+	+	105	+	140	—	—	—	—	+	+
*Jenkinson, J. . .	21	155	137	185	185	126	51	77	65	55	1,036	3rd
+ . . .	20	+	119	155	+	102	—	—	—	65	+	+
+ . . .	18	+	+	145	106	—	+	—	—	—	+	+
+ . . .	22	+	+	+	+	+	+	51	+	55	+	+
†Ward, M. H. . .	20	190	100	145	+	136	+	—	50	50	671	10th
*White, W. E. C. .	18	160	161	130	177	160	52	69	65	60	1,034	4th
*Whitley, A. N. J. .	20	160	142	172	102	120	—	—	—	—	696	8th
+ . . .	26	+	102	110	+	+	74	77	60	55	+	+
+ . . .	18	+	142	140	119	146	61	69	50	60	+	+

REMARKS.

* First-class certificate and life membership.
† Second-class certificate.
a Optional subjects.

— Did not attempt.
\+ Failed, not having obtained half the maximum marks in the subject.

May 31, 1892.

MORETON,
Chairman.

EXAMINATION IN AGRICULTURE.

MAXIMUM NUMBER OF MARKS FOR THIS PAPER, 200. PASS NUMBER, 100.

Tuesday, May 10th, from 2 p.m. till 5 p.m.

1. Describe briefly the general management of a farm of 450 acres (200 acres being meadow and pasture land, the remainder good sound corn and stock land), a herd of Shorthorn cows for producing milk for sale to be the chief aim. The herd to be maintained by rearing all the cow calves, keeping the heifers round to take the place of older cows, drafted from time to time for the butcher, &c. Give the number of horses, cows, heifers of various ages, sheep, weekly labour bill, and amount of capital required to carry on the farm with ordinary success.

2. Give your ideas as to laying down land to permanent pasture, the class of land most suitable, how, and when the best time to carry out the work, the most suitable seeds to sow on rich and poor soils respectively, and what should be the after treatment of the land so laid down.

3. What kind of soil is most improved by an application of chalk, and what quantity per acre is necessary to ensure success? How many years will such a dressing remain unexhausted, and what will be the general effect produced on the soil and future crops?

4. Given a field of 25 acres of arable land left by an outgoing tenant, very foul and full of couch, ploughed once in the autumn. State how you would proceed in the following spring to clean the said field for roots, or bare

fallow, on light gravels, or wet heavy lands, and give the approximate cost of labour per acre in each case and class of soil.

5. State shortly the best kind of grasses for making ensilage, the system to be followed for filling silo or stack, cost of same, and the difference in temperature and pressure, necessary to be observed, in making sweet or sour silage.

6. Given the live weight of cattle and sheep. Show how best to arrive at the dead weight, taking into account the difference in quality and breeding of the animal.

7. Describe the difference in a Shorthorn and a Jersey cow from a tenant farmer's point of view, the kind of feeding most profitable, and the cost weekly of each breed. Give yearly results, taking into account respective merits as milk, butter, and beef producers.

8. Describe shortly the general management of a breeding flock of 300 ewes before and after lambing, and give a brief idea of the number of lambs on an average of years to be expected, and the difference in management if the lambs are intended for sale as fat lambs, or kept round on the farm for store sheep.

9. Give a brief account of the process of haymaking, clovers and meadow grasses respectively, cost of each and quantity per acre, having regard to a fine or showery season.

10. Given 20 gallons of new milk. What quantity of cream on an average would the separator give, and how much butter would be produced after churning, from Shorthorn and Jersey cows respectively? Give a short statement of the improved method of churning, as to the various appliances best to use, and temperature at which to churn according to time of year.

VIVÂ VOCE EXAMINATION IN AGRICULTURE.

MAXIMUM NUMBER OF MARKS, 100. PASS NUMBER, 50.

Wednesday Afternoon, May 11th.

EXAMINATION IN CHEMISTRY.

MAXIMUM NUMBER OF MARKS, 200. PASS NUMBER, 100.

A. GENERAL CHEMISTRY.

Thursday, May 12th, from 10 a.m. till 1 p.m.

1. State the general composition of atmospheric air. Under what circumstances will nitrogen combine with oxygen? How can nitric oxide be converted into nitric acid?

2. Give the composition of the substance which causes the smell of burning sulphur, and some account of its properties. Explain its action with a solution in water of (1) chlorine, (2) permanganate.

3. Describe the chief properties of charcoal and of graphite.

4. Calculate the weight of nitrate of soda which is required to produce 100 lb. of nitric acid, and the least weight of sulphuric acid which will effect the change. ($Na = 23$, $S = 32$.)

5. State the composition of the oxides of carbon. What circumstances increase the solubility of carbonic acid gas in water? How are the properties of water affected by holding that gas in solution?

6. Silicic acid, hydrate of alumina, and many other hydrates are said to be *colloid* substances; state what that means, and what are the special properties of that class of bodies.

7. How do cast iron, wrought iron, and steel differ in composition and in properties? How is iron *galvanized*, and what is gained by the treatment?

8. How is caustic soda made from the carbonate? What is the action of caustic soda with (1) solution of ferric chloride, (2) solution of ammonium sulphate; (3) hot sand; (4) hot manganese oxide with free access of air?

9. State how alcohol may be converted into acetic acid, and give the chemistry of the change. Copper and lead are easily acted on by acetic acid in presence of air: explain what chemical changes occur in these cases.

10. Explain the general constitution of natural fat oils, and how it differs from that of petroleum oils. What are "drying" oils, and to what do they owe their characteristic property?

EXAMINATION IN CHEMISTRY.

MAXIMUM NUMBER OF MARKS, 200. PASS NUMBER, 100.

B. AGRICULTURAL CHEMISTRY.

Thursday, May 12th, from 2 p.m. till 5 p.m.

1. What functions do salts of iron and alumina perform in cultivated soils?

2. Explain the action of decomposing vegetable matter in benefiting soils.

3. Explain the possible advantages to be derived from feeding stock with roots or other succulent food as addition to cake or corn, in preference to giving dry food and water separately.

4. Where is nitrate of soda found? How may its presence be accounted for; how does it occur; and how is it prepared for sale?

5. Devise a field experiment which shall have as its object the elucidation of the possible value of basic slag as a manure for pasture land.

6. Place the following foods in order of their relative richness in oil, viz.: linseed-cake, rice-meal, undecorticated cotton-cake, decorticated cotton-cake, beans, wheat, maize. Give any reasons for not considering the oil percentage as the index of the money value.

EXAMINATION IN BOOK-KEEPING.

MAXIMUM NUMBER OF MARKS, 200. PASS NUMBER, 100.

Friday, May 13th, from 10 a.m. till 1 p.m.

Journalise the following transactions; post them into a ledger; make out a Profit and Loss Account, and a Balance Sheet.

John Thompson rents a farm at 400*l.* a year. On Sept. 29, 1890, his Bank Balance is 334*l.* 5*s.* 9*d.*; petty cash in hand, 6*l.* 5*s.* 2*d.*; J. Matthews owes him for Sheep sold 62*l.* 10*s.*; and his valuations are:

	£	*s.*	*d.*
Cattle	633	0	0
Sheep (exclusive of the above 62*l.* 10*s.*)	740	0	0
Pigs and Poultry	37	0	0
Horses	210	0	0
Corn	707	0	0
Hay and Straw	226	0	0
Growing Crops and Tillages	825	0	0
Foods Purchased (inclusive of 150*l.* 9*s.* then unpaid)	183	10	0
Seeds and Manures	175	0	0
Implements at cost price, less 8 per cent. for depreciation	299	0	0

His Liabilities on Sept. 29, 1890, are:

	£	s.	d.
To H. Thompson, Loan	4,000	0	0
„ H. Thompson, Interest on ditto at 3 per cent.	120	0	0
„ Landlord	95	0	0
„ W. Harris (for Foods purchased as above)	150	9	0
„ Tradesmen's Bills	28	7	4

On Sept. 30, 1890, he paid H. Thompson 120*l.*, and during the year he also drew cheques for:

	£	s.	d.
Rent	150	0	0
Rates, Taxes, and Insurance	73	4	0
Petty Cash	33	0	0
Seeds and Manures	194	10	0
Horses	25	0	0
Cattle	239	0	0
Sheep	370	0	0
Pigs	52	10	0
Implements	41	5	0
Tradesmen's Bills	76	2	0
House Expenses	112	9	0
Wages	806	0	6
Foods Purchased	380	0	0

He sells to a neighbour 10 Store Beasts at 12*l.* 10*s.* each, and receives in part payment a Colt worth 15*l.* and 10 loads Hay at 3*l.* per load; the balance remaining due to him.

He receives and pays into the Bank for:

	£	s.	d.
Cattle and Dairy Produce	562	0	0
Pigs	123	0	0
Poultry and Eggs	17	0	0
Wool	75	0	0
Corn	856	7	6
Sheep	653	0	0
J. Matthews, for Sheep	62	10	0

He sells to his Landlord 55 loads of Hay at 3*l.* 5*s.*, 35 loads of Straw at 30*s.*, and does Carting for him to the value of 97*l.*

On Sept. 29, 1891. He owes to his Manure Merchant 98*l.*, to other Tradesmen 33*l.* 6*s.* 8*d.* His valuations are:

	£	s.	d.
Cattle	594	0	0
Sheep	733	0	0
Pigs and Poultry	50	0	0
Horses	205	0	0
Foods Purchased	147	0	0
Corn	680	0	0
Hay and Straw	254	0	0
Growing Crops and Tillages	894	0	0
Seeds and Manures	207	10	6
Petty Cash in Hand	8	9	7

He values his Implements at cost price, less 8 per cent. per annum for depreciation.

EXAMINATION IN MENSURATION AND LAND SURVEYING.

MAXIMUM NUMBER OF MARKS, 200. PASS NUMBER, 100.

Tuesday, May 10th, from 10 *a.m. till* 1 *p.m.*

1. Express an area of 437·76 acres as a decimal of a square mile. If the area is rectangular and one side is 6,930 ft. long, what is the length of the adjacent side?

2. A B C D is a quadrilateral figure; the lengths of its diagonals (A C and B D) are 752 yards and 593 yards respectively, and the angle between them is 60°: find the area of the figure.

Explain why the data in this question, though sufficient for finding the area, are not sufficient for determining the shape of the quadrilateral. Using a scale of 1 inch equal to 100 yards, draw two different quadrilaterals conformably to the data.

3. A stream has at one point a section 10 ft. wide and 2 in. deep; 6,000 gallons of water pass through the section in a minute; what is the velocity of the stream in feet per minute? (N.B.—You may assume that a gallon of water weighs 10 lb. and that a cubic foot of water weighs 1,000 oz.)

4. The internal radius of an arch is 20 ft.; the thickness of the masonry is 27 in.: find the number of cubic feet of materials used in each foot of the length of the arch.

5. Define a prismoid, and state a rule for finding its volume.

A hole is cut in the side of a hill; the base (A B C D) is horizontal and rectangular; its width (A B) is 30 ft., and its length (B C) is 270 ft.; for simplicity we will suppose the face of the hill to be plane, and to pass through A B; the slope of the face is 1 vertical to 6 horizontal; the slope of the sides and end of the hole is 1 vertical to 1 horizontal: draw a ground plan of the hole and find the number of cubic yards of earth removed in making it.

6. A, B, C, D are the corners of a four-sided field: draw a plan of it from the accompanying notes, using as a scale 1 inch equal to 2 chains, and find its area from the plan in acres.

A	1,100	C
0	520	A
60	400	
37	250	
24	140	
D	000	0
	L. off D.	
	810	0
	700	30
	500	45
C	000	6
	L. off C.	
	750	0
	630	52
	310	0
B	000	0
	L. off B.	
0	680	
20	400	
	210	0
A	000	70
	Begin at A and go N.	

7. A, B, C are three points on the ground, not necessarily in a straight line; a level is first placed between A and B; the back reading of the staff at A is 7·35, and the forward reading of the staff at B is 2·47; the level is next placed between B and C, when the back reading of the staff at B is 3·84, and the forward reading of the staff at C is 5·08; when the level is placed between C and A, the back reading of the staff at C is 2·95: what will be the forward reading of the staff at A?

If the horizontal distance from A to C is 750 links, and the levels have been taken in feet, what is the rise from A to C per hundred feet horizontal?

8. The distance from A to C is known to be 7,342 ft., and from A to B is 5,735 ft.; the angle B A C is found by measurement to be 71° 43′: calculate the distance from B to C.

EXAMINATION IN AGRICULTURAL ENGINEERING.

MAXIMUM NUMBER OF MARKS, 200. PASS NUMBER, 100.

Wednesday, May 11th, from 10 a.m. till 1 p.m.

N.B.—*Not more than half the questions should be attempted.*

1. Explain how the laws are arrived at by which the space passed through by a falling body, the time taken in falling, and the final velocity attained, are calculated.

2. Explain the terms "elastic limit" and "ultimate strength" as applied to materials used in construction.

3. State the laws which govern friction between solid substances, and the friction of fluids against solids.

4. Define what is meant by the terms "specific heat," "latent heat," and "unit of heat."

5. Describe the process of combustion in an ordinary coal fire where there is a considerable thickness of fuel on the fire-bars.

6. Explain the principles involved in the ordinary dry air refrigerating machinery used for cooling chambers intended for the storage of meat and other perishable articles.

7. Sketch an ordinary Poncelet undershot water-wheel, and explain the action of the water. Illustrate your answer by a diagram.

8. Make a sketch to scale of a 10-inch portable engine cylinder, piston, and piston rod, and describe how the slide valve works.

9. Explain, briefly, the peculiarities of the following forms of steam engines: (*a*) non-condensing, (*b*) surface condensing, (*c*) single acting, (*d*) compound, (*e*) triple expansion.

10. What is the difference between a gas engine, a petroleum combustion engine, and a petroleum vapour engine?

11. Write out instructions for the guidance of the attendant of an ordinary portable engine, describing how he is to start a perfectly new and empty engine.

12. Describe the action of an ordinary plough, specifying the part which each of the operative portions of the plough performs.

13. Describe an ordinary corn mill with horizontal mill-stones, and explain the principles upon which it is constructed.

14. The fly wheel of a portable engine runs at 120 revolutions per minute, and is 5 feet in diameter. It is required to drive a threshing machine at 850 revolutions. What must the diameter of its pulley be?

15. Describe two or three ways of joining the ends of driving belts, and explain why the surfaces of pulleys are made rounded.

16. Describe a turnip slicer, and sketch the arrangement of the knives.

17. State the principles upon which centrifugal cream separators are constructed, and explain the advantage of mechanical separation over the ordinary method.

18. Describe the manner in which a horse is harnessed to a cart, and give the conditions which will insure the best application of the animal's strength.

EXAMINATION IN BOTANY.

MAXIMUM NUMBER OF MARKS, 100. PASS NUMBER, 50.

Friday, May 13th, from 2 p.m. till 4 p.m.

Seven questions at least must be answered.

1. What are the characters in the structure of the fruit and seed by which you distinguish a Dicotyledon, a Monocotyledon, and a Gymnosperm?

2. Describe the changes that take place in the seed during germination.

3. Specify the substances in the plant into the composition of which nitrogen enters, and explain their functions.
4. Explain briefly:—Embryo, stamen, exalbuminous seed, panicle, saprophyte, and prothallus.
5. Describe the different stages in the life of the mildew of wheat.
6. What methods other than by seed are there for propagating plants?
7. Why is bone dust a better manure than sea sand?
8. What is the fodder value of dogstail, rib grass, cocksfoot, yarrow, birds'-foot trefoil, and timothy? And give the reasons for your estimate.
9. Give the characteristics of the Natural Order Leguminosæ, and specify ten species of the Order used in British Agriculture.
10. Name and describe in systematic order the plants marked A and B.

EXAMINATION IN GEOLOGY.

MAXIMUM NUMBER OF MARKS, 100. PASS NUMBER, 50.

Saturday, May 14th, from 10 a.m. till 1 p.m.

1. What geological effects result from the action of *snow*, *ice*, and *frost*? Refer to examples in detail.
2. From what are *lime* and *iron* respectively derived? In mentioning examples, state the formations and localities, and the methods of production.
3. Explain, with diagrams, the conditions under which a large and lasting supply of good water may generally be obtained. Compare the present water supplies of London and Glasgow.
4. Describe *quartz*, *felspar*, and *calcite*, giving their composition and mineral characters; and mention the parts they play in rocks and strata.
5. What fossil plants are usually found in the British Islands, and in what formations?
6. Describe, or show by an outline-map, the distribution of *either* the Tertiary Formations in England, *or* the Old Red Sandstone in Scotland. Mention the chief fossils of the groups of strata that you particularly refer to.
7. Write a brief essay on the Physical Geography and Geology of any one of the large counties in Great Britain and Ireland. Give one or more sketches or diagrams in illustration.
8. Enumerate the chief kinds of *building* and *decorative stones* obtained and used in the *British Islands*. Give some particulars as to the localities where, and the processes by which, they are obtained and prepared for use.
9. Compare the economic products obtained from the Earth in the counties of Devon, Cambridge, and Northumberland; and mention the Formations from which they are procured.
10. Describe the range of the best *pastoral* and the best *arable* lands in England, both as to physical features and geological constitution; subdividing each of the two kinds of land according to their fitness for various farming purposes.
11. Explain the terms *volcanic*, *plutonic*, *sedimentary*, *metamorphic*, and *crystalline*, as applied to rocks. Assign *granite*, *rhyolite*, *quartzite*, *coal*, and *flint* to one or more of these classes, and give your reasons for so doing.
12. Name and describe four of the Specimens on the Table.

EXAMINATION IN ANATOMY AND ANIMAL PHYSIOLOGY.

MAXIMUM NUMBER OF MARKS, 100. PASS NUMBER, 50.

Saturday, May 14th, from 2 p.m. till 4 p.m.

1. Describe the manner in which the several animals of the farm collect and masticate their food, and in the act of deglutition say where involuntary action commences and ends.

2. Name the situation of the principal glands which secrete the saliva and state the course which the ducts of the two largest take to enter the mouth. Describe also the action of the saliva on the food.

3. Describe the several structures which are blended together in the formation of a tooth, and their relative proportions. Add also how you would distinguish a molar tooth of a herbivorous from one of a carnivorous animal, without reference to size.

4. In looking into the eye of a horse, an aperture of an oval shape is observed, which, on exposing the eye to a strong light, is diminished in size, and to weak light increased in size. Explain by what means these changes are produced.

5. Say in what part of the eyeball the retina—the seat of vision—is located, and what it consists of.

6. Name the several component parts of the skin, stating which of them is developed to the greatest extent where the skin is thickest, and which of them becomes thicker than natural by attrition.

7. Say how you would recognise the kidney of an ox from that of any other animal of the farm. Describe also the ordinary constituents of the urine.

8. Name the vessels and their situation by which the urine is conveyed into the bladder, and the structural arrangement by which its immediate escape therefrom is prevented.

9. Describe the period of utero-gestation in the mare, cow, sheep, and pig, and say in which of these animals the uterus from its length and size has an appearance similar to a portion of intestine. Explain the reason of this development.

10. Given that the small and large intestines are subdivided, name the designations applied to each of them, particularising the one into which the bile and pancreatic fluids are conveyed for the purpose of effecting chylification.

EXAMINATION IN AGRICULTURAL ENTOMOLOGY.

MAXIMUM NUMBER OF MARKS, 100. PASS NUMBER, 50.

May 13th, from 4 p.m. till 5 p.m.

Candidates will not be expected to answer all the questions on this paper. The replies are to be as short as possible, and where the candidate is not acquainted with the scientific name of an insect, the generally received English name will be accepted.

1. Give as shortly as possible the main points of the life history of the Horse Bot fly (*Gastrophilus equi*), or of the Sheep Nostril fly (Œstrus = *Cephalomyia ovis*). How would you prevent infestation in one case or the other?

2. Give the scientific names, or the corresponding popular names, of the three successive stages, after the egg, through which all insects pass.

3. Mention one or more orders of insects in which the shape is entirely dissimilar in each of the three successive stages; and one or more orders in which the shape in each of these stages is nearly similar.

4. State shortly the chief characteristic differences between the larval conditions of moths, beetles, and two-winged flies; *or* state, has a fly maggot legs? have beetle grubs (or some divisions of them) legs and pro-legs? how many pairs of legs and pro-legs have moth caterpillars usually?

5. Name some of the attacks of insects, eelworms, or so called "insect allies," commonly infesting clover or field beans.

6. Mention shortly anything you know about prevention of attack of bean-seed beetles (*Bruchi*): as, comparative amount of infestation in autumn or spring-sown beans; effect of presence of infestation on healthy germination of seed; and methods of treating infested seed.

7. Mention the most commonly serviceable remedy for Black Aphis, or "Colliers," on growing bean plants.
8. Mention any method of preventing or lessening likelihood of attack of maggot of the wheat bulb fly (*Hylemyia coarctata*) to young wheat.
9. Name one or two kinds of insect (or eelworm) attacks to corn, clover, carrots, or onions, or any common crop, of which the recurrence can be prevented on infested land by deep ploughing, or ploughing with skim coulter attached; or, where area is not too large, by trenching.
10. Name the chemical manure which is often found of use in carrying mangel well through attack of leaf maggot; *i.e.* of larva of *Anthomyia betæ*.
11. In fruit farming some kinds of infestation may be got rid of by spraying with poisonous insecticides, and others by the use of sticky washes; state one or two of the infestations to which each kind of application is suitable.

REPORT OF ROTATION OF DISTRICTS COMMITTEE.

The Committee are of opinion that the present system by which England is divided into seven districts for the purposes of the Society's Meetings has worked on the whole exceedingly well. The only way in which it could be improved would perhaps be to make the Metropolis and certain of the very largest provincial towns ex-territorial, so far as the geographical distribution of the Society's districts is concerned. Taking as a basis a population of half a million, the following towns are those which appear to need special consideration :—

	Population in 1891.
London	4,211,000
Liverpool	518,000
Manchester, 505,000; with Salford, 198,000	703,000
Birmingham, 429,000; with Aston Manor, 69,000	498,000

The nearest approaches to these figures are Leeds 309,000, and Sheffield 285,000; but there is not the same reason for according special treatment to these towns, as they are both in Yorkshire, a county which already constitutes a separate district by itself, and in which there are several large towns which are within easy distance of one another, if the Country Meeting should be held at any of them.

The Committee think it will be generally agreed that it would be impossible to put London into any fixed rotation, as the Society's Meeting could only be held in the metropolitan area under exceptional circumstances and at uncertain intervals. There remain, therefore, as possible centres for the Country Meetings in the regular rotation, only Birmingham, Liverpool, and Manchester. The two last are in such close proximity that a Country Meeting at one would serve for the other, so that the Meeting might be held in the two cities alternatively.


MAP OF
ENGLAND
AND
WALES
SHEWING ROTATION OF
DISTRICTS & PLACES
AT WHICH THE SOCIETY'S
COUNTRY MEETINGS
HAVE BEEN HELD.
ENGLISH MILES.

If this suggestion be adopted, a rotation for nine years might be thus arranged :—

(1) Present District A . . .	Some town in the counties of Bedford, Buckingham, Cambridge, Essex, Hertford, Huntingdon, Middlesex, Norfolk, Oxford, or Suffolk.
(2)	At BIRMINGHAM.
(3) Present District B . . .	Some town in Cumberland, Durham, Northumberland, or Westmoreland.
(4) Present District C . . .	Some town in Derby, Leicester, Lincoln, Northampton, Notts, or Rutland.
(5)	At LIVERPOOL and MANCHESTER alternatively.
(6) Present District D . . .	Some town in Berks, Cornwall, Devon, Dorset, Hants, Kent, Somerset, Surrey, Sussex, or Wilts.
(7) Present District E . . .	Some town in YORKSHIRE.
(8) Present District F . . .	Some town in Gloucester, Hereford, Monmouth, Salop, Stafford, Warwick, Worcester, or South Wales.
(9) Present District G . . .	Some town in Cheshire, Lancashire, or North Wales.

JACOB WILSON, Chairman.

April 6th, 1892.

QUARTERLY REPORT OF THE HONORARY CONSULTING ENTOMOLOGIST.

JUNE, 1892.

THE past three months, and more especially the last four weeks of the quarter, have been remarkable for a greater amount of inquiry regarding crop infestations than I think has ever before occurred.

I much regret to have to mention that the DIAMOND-BACK MOTH has again made its appearance.[1]

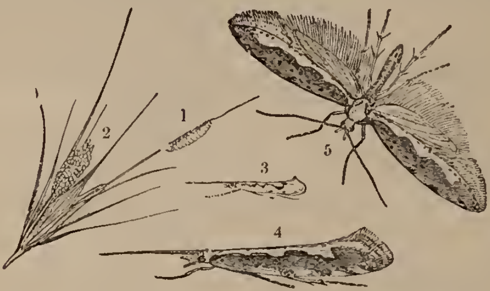
On May 26, specimens of moths, which had appeared that day in rather numerous quantity on swedes which had just brairded, were sent me from near Goswick, Beal, Northumberland. The moths, though apparently Diamond-backs, were too much rubbed for me to be absolutely certain of the species. I therefore requested further specimens, and the receipt of these on May 30 left no doubt of the presence of the true DIAMOND-BACK MOTH—*Plutella cruciferarum.* I hear from my correspondent that the moth

[1] For a full report of last year's attack, see pages 596 *et seq.* of Journal. Vol. II., Third Series. Pt. 3. 1891.

has been seen at other places, but no publicity had been given to the matter.

I have also information—received May 29—from near Pocklington, Yorks., with specimens accompanying, showing presence of this same attack. In this case the moths were noticed flying about in large numbers on a plot of about five acres of cabbages which were just nicely above ground. Of course, the reappearance of the pest is most unsatisfactory; but, though no doubt it was very injurious in many places last year, still it did not cause anything like the amount of mischief that was feared, and from the very early date of observation now (whilst it is still open to remedial measures, instead of being sheltered beneath the spreading leafage), it is to be hoped that we may keep it in check.

Amongst dry dressings which were reported last year as serviceable, remedially, the following were more especially noticed:—A mixture of 10 cwt. of soot, 8 cwt. of nitrate of soda, and 1 cwt. of sulphate



PLUTELLA CRUCIFERARUM.[1]

1, Caterpillar; 2, eggs; 3, diamond-back moth (all natural size); 4, 5, diamond-back moth, at rest and flying (magnified).

of ammonia, mixed well, and sown broadcast by hand while the dew was on the leaves, at the rate of 1 cwt. per acre. The application of dry dressings should in all cases be made when the foliage is damp, in order that the powder may adhere.

Nitrate of soda and salt—about 4 stone per acre of each sown by hand along the drills—have also been found useful, and so has a mixture of three-quarters soot and one-quarter lime sown on the plants.

I do not find mention of "Fisher Hobbs mixture" (which is an excellent deterrent for turnip-flea beetle) being tried, but I should consider that in the present early stage of the attacked plants it would be very likely to be of service. This consists of 1 bushel of quicklime, 1 bushel of gas lime, 10 lb. of soot, and 6 lb. of sulphur, pounded up together very fine, and distributed when the dew is on. The above is enough for two acres of young turnips.

Nitrate of soda, it is unnecessary to say, is very useful, by

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[1] This figure is inserted by permission of Messrs. Blackie & Son, Glasgow.

pushing on the crop. The following observation, however, given by Mr. James Fletcher, Consulting Entomologist of the Dominion of Canada, in his official return in the Government Reports of the Experimental Farms of Canada, page 167, is well worth consideration : "but the most satisfactory remedy was a kerosene emulsion." This so-called emulsion is a mixture of boiling soap-suds, or soft-soap suds, with kerosene, churned or violently stirred until the ingredients unite ; but as I have scarcely met with anyone in this country who could do this properly, though it is one of the commonest American remedies, I would suggest purchase of a very similar soft-soap mixture, which may be bought in solid form ready for diluting. This was specially prepared for some bad insect attack in Mauritius, on the property of one of my correspondents, by Messrs. Morris and Little, of Doncaster, and is sold under the name of Anti-pest, and I believe it to be a very good application.

Mr. Fletcher also states that when the caterpillars appear early in the season before the cabbage head begins to form, Paris green and flour, one part of the former to fifty of the latter, may be dusted on the plants, but that the kerosene emulsion would probably be the best remedy, as the fluid would drop on those which fell to the ground, even if they were not touched by the spray on the leaves. Paris green, if used in powder, may be weakened down to a safe rate of application by plaster of Paris, in proportion of 50 lb. of the plaster to 1 lb. of the green (the same proportion as is mentioned for flour), or gypsum may be used. A safe and simple method of application on a small scale is to put the powder in a box, with one end covered with wire gauze, or finely perforated. The box being fixed at the end of a stout stick, about three feet long, is a convenient implement for distribution. The bearer, by striking the handle with another stick, causes the powder to fall evenly, and if he is careful to walk to windward of his work there is little danger of his inhaling the powder. But looking at the poisonous nature of the application, it appears to me that where it is sent broadcast into the air by machine power, there is great danger of its being inhaled both by men and horses, and though the method may be safe, I should not myself like to recommend it.

Such different proportions are given for different kinds of leafage that it is impossible to say how much powder would be needed for an acre, but for dressing potatoes 3 lb. of green to about 36 lb. of flour is one amount given, so that the above recipe of 50 lb. of flour to 1 lb. of green (the strength advised for Diamond-back caterpillars early in the season) would presumably dress a good deal more than one acre of infested seedlings.

The method of use and proportion of Paris green in solution, and also names and descriptions of various kinds of spraying machines, are already before the public ; but I shall have pleasure in giving every information in my power.

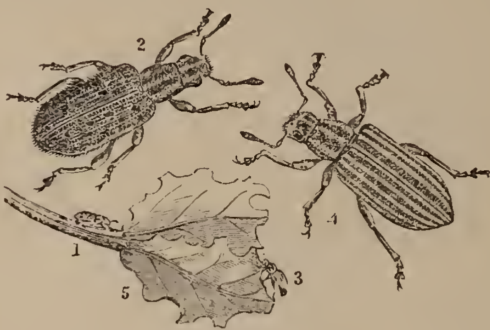
It may be some assistance in identifying the Diamond-back moth, to remind readers that this little grey moth takes its name from having a row of spots or saw-like markings down the hinder edge of

each fore wing, which, when the wings are folded in repose (so that the pattern is joined), give the appearance of a row of pale diamond markings with a dark stripe on each side running down the middle of the back.

Amongst other crop infestations the most serious attack which has been reported is that of the very unusual amount which has appeared in various localities of the PEA-AND-BEAN WEEVILS, the *Sitones lineatus*, and *S. crinitus*, on the leafage chiefly of young peas; but, to some degree, also on beans.

These beetles are small, just over (or under) two lines in length, cylindrical in shape, and greyish, or, if old specimens, blackish in colour; and they feed by gnawing away the edges of the leaves, working gradually onwards until, in bad attack, the whole leaf may be devoured.

This infestation is one of our commonest kinds, so far as garden crops are concerned, and the beetles are to be found in great



1, 2, *S. crinitus*; 3, 4, *S. lineatus*, natural size and magnified; 5, leaf notched by weevils.

quantities on peas at harvesting time, but I never before have met with such severe infestation on field crops, so early in the year.

From Alcester (Warwickshire) a correspondent reported that the ground seemed to be teeming with the insects; that the attack was general in the district, and affected beans as well as peas. From near Severn Stoke (Worcestershire), a neighbourhood where early peas are grown, it was reported that many acres were destroyed. Near Sandy, in Bedfordshire, they were noted as threatening ruin to winter beans, but in Essex the attack was especially widespread and severe. From Rochford, report was sent on May 2, of some of the earlier sown fields being apparently quite destroyed by the infestation, and from Chelmsford, a little earlier, notes were sent of scores of acres being destroyed. Similar reports of the peas having suffered terribly were also sent from Romford, and from Southminster likewise the report was very bad.

This unusual amount of appearance, is, I conjecture, attributable to weather influences, and might very likely arise in part from the

first brood of beetles developing earlier than usual, consequent on a period of warm weather in the early spring; and in part also from the difficulties of getting land into cultivation in the winter, allowing the shelters for the hibernating beetles to remain undisturbed. From these shelters (when woke up by sunshine) the powerful wings of the beetles would enable them to distribute themselves far and wide.

Very little appears to be known as to remedial measures, but, in some cases, I am aware that dusting the plants with lime, or lime and soot, or some similar deterrent, has done good. I have therefore drawn attention to this, and especially to the importance of dusting when the dew is on (or the leafage damp), so that the powder might adhere.

There has been some application regarding various common grubs at young corn, and amongst these DADDY LONGLEGS grubs, where reported at all, have been very troublesome; and I have notes of this grub being very hurtful to young mangel. In this case I have

Gooseberry Sawfly (male caterpillars and cocoon), all magnified.

recommended application of nitrate of soda, as in addition to the nitrate pushing on the mangel, this chemical is particularly deleterious to Daddy Longlegs grubs, where it can be brought to bear on them. For this attack to corn plants I have also suggested a mixture of guano and salt, which sometimes answers very well. I have *not* recommended application of salt alone, as in many cases I am aware of it having failed.

I have also suggested the well-known remedy of rolling with a Crosskill's or Cambridge ring-roller, but taking care to roll very slowly, as, if these soft grubs can be thoroughly well pressed down, and the ground firmed round them, it is found to answer well.

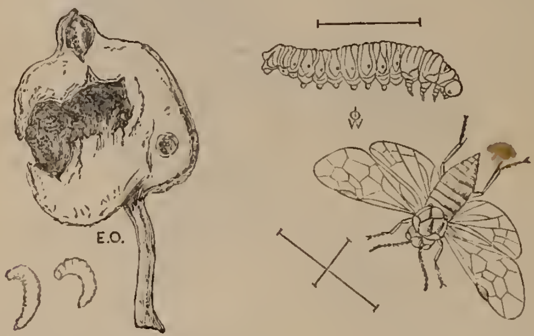
Inquiries as to various other common field crop pests have been sent in, but not to an extent needing report.

Amongst fruit infestation there has been some bad attack both

of GOOSEBERRY-MAGPIE MOTH caterpillars, and those of GOOSEBERRY SAWFLY, both of which infestations might be easily prevented by attention to the simple directions often given. Just now the Gooseberry Sawfly caterpillars are passing to their final moult, and are worth observation, as in this state their pale even green tint, with clear yellow at the head and tail, is so very different from their previously black spotted condition, that they are liable to be mistaken for yet another infestation.

The observations of APPLE SAWFLY (which is an important attack) have been completed by Mr. Coleman rearing the perfect insect from the caterpillars from which his notes of habits were very carefully and skilfully taken last year, and the specimens placed in my hands appear, as far as I see at present, to prove that the infestation is, as we supposed, that of the *Tenthredo* (*Hoplocampa*) *testudinea*, of Klug.

Observations are being continued, as in previous years, on the bush fruit pests, and in the course of reporting I was informed by Mr. Gibbon, of Seaford Grange, Pershore (Chairman of the Evesham Fruitgrowers' Experimental Committee), that he had found a mix-



Female Sawfly, caterpillar magnified, with lines showing natural size, after Prof. J. O. Westwood; caterpillars natural size, and infested apple.

ture, of which I had sent him a sample, so serviceable for destruction of "RED SPIDER," that in case of an outbreak of this pest he intended to employ it largely. This mixture is, so far as I am aware, very similar in constituents to the soft soap and kerosene emulsion, so much used in America, but being in solid form, to be diluted for use, there is no difficulty in mixing the ingredients. I shall be happy to give information regarding this, or regarding a soft soap and sulphur wash, in which the sulphur is soluble, to any applicant.

Amongst attacks of wood-eating caterpillars, a word seems needed regarding the occasional habit of some of the caterpillars of the CLEARWING MOTHS to go into chrysalis in the ground instead of in the stem. Amongst some specimens which were lately sent me from an

infested alder plantation, I noticed that such had been the case, and where this is so, it is manifest that merely to cut the trees down to stumps leaving the grubs or chrysalids in the ground does nothing to check recurrence of the attack. This attack is easily known by the large tunnellings filled with results of the feeding of the caterpillar, which in the specimens sent me was white with a darker head.

Many kinds of infestations of ordinary fruit and field crops, and some of forest trees, have been sent for identification and advice, but, excepting in cases of some special interest, it is unnecessary to enter on these at present.

Amongst colonial applications I have been giving the very best attention in my power, and collecting local and scientific documents, regarding the appearance and spread of the SHOT-BORER BEETLE, the *Xyleborus perforans* (=*affinis* of Eichhoff) amongst sugar cane in St. Vincent, Barbadoes, and others of our West Indian Islands, which I hope to prepare at once for publication, fully illustrated. Various other points of inquiry concerning colonial crops are occurring, as with regard to Cocoa Beetles, Coffee Scale, Tea Bug, to which, so far as I am able by reference or consultation, I give the very best attention in my power.

I have also received inquiry as to the cause of great injury to grass in the Faröe Islands. These being Danish, not British possessions, certainly do not lie in the department of the staff of the Royal Agricultural Society of England, still I thought I could not be doing wrong in sending over information and printed matter which might assist in such a serious difficulty.

ELEANOR A. ORMEROD.

Notes, Communications, and Reviews.

TECHNICAL TRAINING OF STOCKMEN.

As a practical farmer I feel that our agricultural labourers and stockmen would be more useful did they possess fuller technical knowledge of the different matters upon which they are employed. They would not only be worth more as workers, but it would then be in their power, if not to prolong the lives, at any rate to render the existence of many animals of the farm more enjoyable and at the same time more useful.

No one engaged upon the farm can help being interested in the livestock with which he comes in daily contact. Even putting aside all feelings of kindness and humanity, there must of necessity arise both thought and anxiety about those animals through which is obtained, in a great measure, the income derived from the soil. Yet to my mind it has always appeared that the interest and care bestowed upon them is by no means all that can be desired, and I have, before this, affirmed that not half the stock in the country are managed or cared for as they ought to be. The tenant, having the largest interest, has also the greatest responsibility, but to carry out his part to a successful issue he must be backed by intelligent, careful servants, who *need to be taught* that their interest is bound up with the well-doing of the animals under their charge. Amongst the members of a farmer's own family, if one suffers from cold, indigestion, or aches or pains of any kind, he can speak and make his complaints known at an early stage, and remedies may be at once applied. Not so, however, with his large family out of doors, in the stable, the cattle-shed, or the sheep-fold. The master by close attention has to find out their ailments, and has to be ever on the watch for *symptoms*. As, moreover, it is impossible that his eye can be on all his stock at once, it is of vital importance that those employed by him should be educated and instructed in technical matters relating to their respective occupations.

Take, as a case in point, the Cart Horse. How much depends upon his groom! How essential it is that the groom should recognise the importance of, and know the best manner of giving him, a good mouth; of gaining his confidence by kind and gentle usage; and of

subduing, rather than encouraging, his high-strung nervousness! How many horses are spoilt by neglect of these points, and on the occasion of some slight fright or noise, make off, with a cart, waggon, or drill, perhaps doing much mischief, and for ever after requiring redoubled care and attention!

How essential it is, again, for a horseman to know something of the horse's digestive functions, and to recognise that an overburdened plate, or manger, at any time is not the safest way to ensure his making a hearty meal! The horse enjoys a clean manger, with a little food therein at a time, as much as his master prefers a clean plate without the whole of his dinner placed thereon at once. Further, it is against the laws of Nature, after a horse has made a good meal, for him to be put directly to hard and *quick* work; it is better far to start steadily, and, after an hour or so, to proceed more briskly and do what has to be done, allowing time to slacken the pace again before leaving off, and thus bringing the horse into his stable cool, and fit to either eat or drink without fear of gripes, &c.

Let the horseman know that much of his worth to his master depends upon the manner in which he studies the comfort of his horses during their labour. If a horse's head is reined up too tightly, or his jaw is tied down to his chest, or if, as I have seen, both horses on a plough are so tied to each other that neither has freedom of motion, and consequently works fretfully all day, we have in such cases about as sure a method of working the flesh off an animal as can be devised, besides inflicting positive pecuniary injury upon the master. Let the horseman be instructed as to the why and wherefore of the things he daily sees. Teach him why it is wrong, cruel, and cowardly to place his twelve or fourteen stone weight directly upon the loins of a mare heavy in foal, and thus ride jolting to and from his work; why, when the animal is in this condition, great care is necessary during frosty weather, &c. Let him be made familiar with the shape and make of different horses' shoulders, and be taught so to adjust the trace and seals on a collar as to command the most leverage or draught power. Let him be instructed in the formation of the horse's foot, as an aid to which Professor Brown's pamphlet, "The Structure of the Horse's Foot," will be found exceedingly useful. Let him be shown how standing in boxes, or stalls, or even in yards, on manure, is ruinous to the feet of the horse, and how necessary it is to keep the stable clean. In addition to the foregoing, those who have charge of horses should be made acquainted with all *premonitory symptoms* of the common complaints of the horse. Remedies might then often be resorted to before it is too late, on the principle that prevention is better than cure.

With regard to cattle, cows, &c., instruct the man in charge that, if due regard is not paid to certain first principles or conditions, it is absolutely useless to look for profitable results; that a certain amount of warmth or heat must first be generated from the food consumed before an ox will fatten, or a cow give her maximum quantity of milk; that a filthy wet bed tends to great discomfort, and that to gain the full amount of beef or milk the surroundings

of an animal must be such as to ensure not only warmth, but ease and quiet. Tell the cowman the cause of milk fever, describe the kind of treatment producing it, point out the remedies, or rather the preventatives, the actual necessity of freedom from excitement, &c. Explain to him the results of feeding on various kinds of food, so that he may be cautious not to produce either fever or purging, from food and roots ill-prepared and injudiciously mixed.

In the case of sheep and shepherding there is very much to learn. In my own district in the East of England this shepherding business is highly important. We want men with better instruction. I am firmly of opinion that a great percentage of our losses might be avoided if more care, combined with greater technical knowledge, could be insured. After a life-study of this branch of farming, my experience is that, although I yearly learn something new, there is yet a great need of more information. Let some qualified man lecture to us about the common ailments of the sheep; let him dissect an animal suffering from disease in our presence. In this way I have learnt more from my veterinary surgeon than from most other sources. On our flock farms we invariably experience some fatal sickness just before the lambing season begins. Sometimes our sheep are found dead in the morning, apparently having died in their sleep. Another season we find the first symptoms are dizziness, foaming at the mouth, &c. Another year something causes abortion; this year, for instance, it was the young sheep of the flock that suffered in this way, whilst the older animals lambed in due course. Yet another season they die from inflammation and straining after lambing, and at other times from garget.

I notice, however, that we seldom suffer, to any great extent, from two of these complaints in one and the same season, though it is rare for any one farmer to suffer alone. All in the district experience more or less the same complaint, doubtless due to the same cause. Our uncertain climate and the varied state of winter food, the perhaps unripe, or it may be quite ripe and frost-rotted turnips, the different ingredients contained in the same roots when in different stages of growth or decomposition, may, in a great measure, account for this. Nevertheless, here is a wide field of observation, when those who have the opportunity are *taught to observe.*

Shepherds should be brought to recognise the necessity of cleanliness. How often is blood-poisoning, for example, contracted through neglect of this! I can look back upon scores of cases—fatal cases—that, had I known what any shepherd ought to know and *could be taught*, would never have been a source of trouble and loss. Let our shepherds have explained to them that blood poisoning may arise from decaying or decayed vegetable or animal matter, which is easily taken up and is in its nature deadly and contagious. We should then hear far less of straining after lambing, or of the nostrums warranted to cure it, but which so seldom have the desired effect. Explain, further, the cause of blowing and garget, and how to avoid these ailments.

Let shepherds be instructed, also, how best and most humanely

to operate in parturition cases, especially under the different aspects of false presentations. Explain to them how detrimental are all causes of excitement at this time. We shall then find fewer cases of neglect of precautions against disease, the observance of which precautions denotes a valuable shepherd and tends to ensure, with little loss of ewes, a good crop of lambs.

Perhaps I may be told that the master should instruct his man. We have heard, however, of what happens when "the blind lead the blind," and I confess that there are still masters who have not given this subject the attention it deserves. I am of opinion that flock-masters ought to meet together at least once a year to compare notes on the management of their flocks, especially as the management varies so greatly with the seasons.

It is true that there are both ignorance and prejudice to be overcome. As a rule, shepherds think that, if *they* do not know their own business, it is known by no one else. Can we wonder at this? Have shepherds not been much neglected? How seldom is any professional man, qualified by education and experience, called in to their assistance! They have been left to grope along in the way their predecessors trod for ages, when the value of a sheep was so small that it was considered not worth much trouble to save its life. They have never had the lamp of scientific and veterinary research lit up to guide them; but let us hold it forth and see if they will read by its light. The gulf between master and man is not wide nowadays, and the master who does try to instruct needs someone behind him to back him up, or, as likely as not, if he talks about chemicals and blood-poisoning he is thought crazy by his shepherd and not worthy of attention.

Turning for a moment to local considerations, Mr. Ernest Prentice, the indefatigable Secretary of the Suffolk Sheep Society, informs me that of the 460,000 sheep carried by the county of Suffolk, probably about 200,000 are breeding ewes. He estimates our loss at 6 per cent. Now, if by a more extended knowledge of shepherding we could reduce this loss even 1 per cent., the amount saved would be 6,000*l*. a year, estimating each ewe as worth 60*s*. But when we take into account the grazing sheep in the county as well, and reflect how many of these are lost during the winter on turnip-feeding, I am confident we might look for much greater results.

This brings me to the question of how best to impart the needed instruction to our agricultural stockmen. The benefits to accrue from a better education in relation to the various callings on a farm might be set forth in a cheap pamphlet and distributed in country parishes. Let it be known that a man with such knowledge is worth higher wages, that he will command more money wherewith to purchase comforts for the wife and little ones at home, and that a man with a certificate of technical knowledge, especially a shepherd, will obtain a better post than he otherwise would. I myself would give considerably higher wages. If there is a lecturer, let him visit the parish, not in the midst of winter, but perhaps in May, when masters and men can sit out of doors, with our pipes if you like, and talk the

matter over with a living or dead specimen of an animal before us. The lecturer, although a stranger, should be one who knows his business, and who can talk to country people without the use of scientific words and phrases. Quite recently two flockmasters, who have both been very successful in obtaining for their shepherds the prizes annually offered by the Suffolk Agricultural Association, "to the shepherd who shall have reared from not less than 400 ewes the greatest number of lambs with the smallest loss of ewes," were talking over this education question, and both agreed that their own medical men had, when in attendance at their different homes, imparted much valuable information. These good doctors, in their kindness of heart, were not only drawing attention away from the oftentimes very anxious cause of their presence, but were, in truth, imparting sound technical education on the subject of the farmer's business.

Let prizes, good substantial prizes, be offered to those who best pass a rather stiff examination, or who write the best essay, following in the latter case the example of Scotch shepherds.

If it is not practicable, from want of funds, so to treat a large area annually, take a district yearly. Farmers must assist in these efforts ; it is to their interest to do so. In my own locality I am prepared to do my best ; and if a shepherds' class is formed for our sand district, both my neighbours and their shepherds and the shepherds' boys shall be welcome at my farm, and I will gladly provide a sheep or two for the purpose of demonstration.

Though I fear I have not been very successful in suggesting how to impart desired information, yet I trust I may have shown that there is a need of better technical knowledge in the farming business, and especially in the care and management of stock.

ALFRED J. SMITH.

PETROLEUM: ITS SOURCES AND USES.[1]

PETROLEUM or mineral oil has been in commercial use for many years as an illuminant, for which purpose its employment is steadily extending, especially among the poorer members of the community, because it has proved itself to be the cheapest and at the same time the most brilliant means of lighting at present available. Its use is also extending for the public lighting of moderate-sized towns and villages, in which, owing to the comparatively small production of gas, and to the great length and cost of mains compared with the value of the services taken from them, the price of gas runs high. At Erith, in Kent, for example, where the charge is 4*s.* 6*d.* per thousand cubic feet, the Local Board find that oil lamps give quite

[1] From the Address of the President to the Institution of Mechanical Engineers, Spring Meeting, 1892.

as good a light, and are sensibly cheaper than gas, having besides the advantage of being capable of arrangement without reference to the situation of the gas mains. The oil lamps, however, though very good and efficient, are by no means perfect, for they are apt to go out occasionally, especially in stormy weather. This I attribute partly to the somewhat defective make, quality having been sacrificed to cheapness; but there is undoubtedly room for invention, or at least considerable improvement, in the construction of out-door lamps intended for burning heavy mineral oils.

In lighthouses petroleum has now become the standard illuminant. Cautiously and step by step, as became the introduction of a substance in some of its forms not free from danger, it has gained ground; and it has now established itself as next in value to electricity, as a perfectly safe, trustworthy, and economical illuminant. The lamps are all constructed on the principle of Argand, and have concentric wicks rising to as many as ten in number, the oil being maintained at a constant level between 2 and 3 inches below the flame. So perfectly adapted to the oil are the structure and material of the wick, and the adjusting mechanism, that a lamp will burn some 500 hours consecutively without trimming. The unassisted candle-power of these lamps ranges from 20 to 2,215.

As a source of power, petroleum is rapidly gaining ground, especially where motors of moderate size are needed. The records of the Royal Agricultural Society show that, for many years past, efforts have been made to produce petroleum engines, but never, until quite recently, with any practical success; chiefly, I think, because oils of low flashing point, or petroleum spirit, were used. The dangerous nature of these would alone have condemned any engine, however efficient for general use; save, indeed, in the form advocated by Mr. Yarrow, in which petroleum spirit acts only as the working substance or agent for the conversion of heat into work, and is therefore not expended, except by way of leakage, so that the difficulty of supply does not arise. It was not till the Show at Nottingham [1] in 1888 that Messrs. Priestman brought out their engine working with heavy oil having a high flashing temperature. That engine was tested by Lord Kelvin and by myself independently, and gave an efficiency of one brake horse-power to 1·73 lb. of oil. At the next year's Show (Windsor, 1889) the consumption fell to 1·42 lb.; at the next (Plymouth, 1890) to 1·243 lb.; and Professor Unwin this year reports [2] that a brake horse-power has been obtained by the combustion of 0·946 lb. It is proved by experience that these engines do not need any special attendants; neither boiler nor chimney is required; the fuel is much more cleanly; and the engine can be got to work in a few minutes. It is certain, therefore, that they will increase greatly in favour with the public, and will prove formidable competitors to gas engines. Naturally also, Messrs. Priestman's success has stimulated the inventive spirit,

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[1] *Journal of the Royal Agricultural Society*, Vol. XXV., s. s., 1889.
[2] *Proceedings of the Institution of Civil Engineers*, Vol. CIX., 1892.

and already the records of the Royal Agricultural Society show that several successful forms of motor are in the field, the tendency being to simplify the details and to render them less delicate in adjustment. But much still remains to be done. The useful work on the brake is under 14 per cent. of the energy latent in the fuel; while the heat carried off by the water-jacket round the cylinder and by the exhaust is equivalent to 75 per cent. of the total thermal capacity of the oil. This loss surely constitutes a storehouse from which we may hope to appropriate a good deal. I think that probably a combination of the direct combustion engine with the spirit engine of the Yarrow type will give the best results, especially if a more advantageous cycle than that of the Otto gas engine can be adopted.

As a lubricant also petroleum is taking a prominent place. The circumstance that it is devoid of fatty acids makes it peculiarly fitted for use with steam machinery, and for work which it is desired to protect from rust or verdigris. It can be obtained also of any degree of fluidity, from the most mobile of liquids to the consistency of jelly, while its cheapness serves to recommend it to every consumer.

There are probably few people who, having realised the rapid increase in the use of petroleum, have not asked themselves the question, whether the stores of petroleum in the bowels of the earth will long be able to stand the demand made upon them. I will not enter into statistics, because, when we come to talk of fifty or a hundred millions of barrels being annually consumed, the figures do not convey any clear idea, at any rate to my own mind, of the magnitude of the consumption; it is however already very great, and is increasing with extraordinary rapidity, doubling in about ten years. The statistical trade returns, besides, take no account of the enormous volume of natural gas evolved in some localities, nor of the waste which occurs when the fountains of petroleum get out of control.

It is commonly assumed, without any good reason however, that petroleum is of the nature of coal, and has been formed, like it, out of the *débris* of primeval forests or out of the remains of marine animals; and that, like coal, the deposit will be exhausted in time. But it seems not unlikely, as the distinguished Russian chemist Dr. Mendeleeff has suggested, that petroleum is constantly being formed by the action of water on metallic deposits in the heated interior of the earth; and that there is good hope, therefore, not only that rock oil can never be exhausted, but that it will be found in most parts of the earth if borings sufficiently deep be made. It should be borne in mind, moreover, that the depth of a boring adds very little to the cost of getting, because the oil usually rises naturally to the surface or very nearly to it.

Petroleum is an almost pure hydro-carbon, the American variety having a composition homologous with marsh gas or fire-damp, CH_4 (where C denotes carbon, and H hydrogen); that is to say, composed according to the general formula C_nH_{2n+2}, the value of n ranging

from 1 to 15. The Caucasian oil has the general formula C_nH_{2n}; and olefiant gas or ethylene, C_2H_4, appears to be the lowest of the series, n rising in value to 15. When exposed to heat—either in the ordinary process of distillation, or when, by working under pressure, the temperature is raised above that due to the atmospheric boiling point—the crude oil "cracks," as it is termed, and the vapours of different boiling points, but still of a homologous chemical composition, are given off in succession, and in varying proportions; indeed, in some districts rock oil issues from the ground in the form of gas, even at ordinary temperatures and pressures.

Petroleum, in a form not to be distinguished from the natural product, has been produced artificially by the action of steam at high temperature and pressure upon the carbides of metals, more especially on those of iron: the water is decomposed, the oxygen combining with the metal, and the hydrogen, in part at least, with the carbon. This circumstance, among others, led Dr. Mendeleeff in 1877 to propound a theory which I will sketch very briefly, because, if correct—and I believe it to be gaining in general acceptance,—it gives an assurance of inexhaustible supplies of oil, and also indicates the probability of the occurrence of this product in every part of the world, quite irrespective of the age of geological formations; and so holds out motives to engineers to perfect the means of penetrating much deeper into the heart of the earth.

Laplace's theory of the origin of the planetary system is generally accepted as correct; and according to it the earth must be composed of the same materials as the sun. This view has in latter days received striking confirmation from the spectroscope, by means of which it has been demonstrated that there exist in the sun many of our metals, and especially iron, in the state of vapour: while meteoric stones, which belong to the same order of substances as the planets, have been found by actual analysis to be largely composed of iron and its carbides. The law of the diffusion of gases would lead us to expect that on the condensation of the metallic vapours the substances of higher specific gravity or greater atomic weight would collect chiefly nearer the centre of the future globe, while the lighter matters would tend to aggregate on the surface. The mean specific gravity of the earth is about 5, while that of its superficial deposits ranges from only $2\frac{1}{2}$ to 4: so that it is evident that the interior of the globe must be composed of substances having high specific weights—such as iron, for example, which ranges between 7 and 8. Moreover, it is certain that the rocks at a comparatively short distance down from the surface exist in a highly heated if not in a molten condition; and that the solid crust covering them is relatively thin and easily fissured, as is abundantly proved by the upheaval of the land in geological and even in modern times, and by the earthquake disturbances which prevail more or less over the whole world even now.

Dr. Mendeleeff points out that the oil-bearing regions generally lie parallel to mountain ranges, such as the Caucasus in Russia, the Alleghanies in America, and the Andes in Peru; and that petroleum

does not appear to belong to any particular geological formation, inasmuch as it occurs in Europe usually in rocks of the Tertiary period, while in the United States it is found in the Devonian and Silurian strata, which are so nearly devoid of animal and vegetable remains. He also points out that, on account of the volatile nature of rock oil, it could not have been borne from a distance like many other deposits, but must have been formed very near the spot where it is found. The fissuring of the earth's crust by the upheaval of mountain chains and by other disturbances allows surface-waters to penetrate into the heated internal portions of the earth; and there, coming in contact with the glowing metals and their carbides, they give rise to the chemical reactions which result in the formation of petroleum in the state of vapour, and in the evolution of steam. These vapours penetrate through the fissured crust into the upper and cooler regions, where they are either wholly or partially condensed, forming deposits of petroleum very commonly associated with water; and the gases which cannot be condensed by cold escape to the surface. The precise compounds which are formed depend upon the temperature and pressure met with; and hence we find associated every grade of product—gas, oil, mineral pitch, ozokerit, and other substances. The extraordinary average persistence of the oil wells leads to the conviction that the substance must be forming as fast almost as it is removed; and I have very little doubt that improved boring appliances will enable engineers to penetrate to depths not even dreamt of now. Hence, it is likely that, by the time that our coal resources come to an end, from the exhaustion of the mineral, or from the condition of perpetual strike to which we seem tending, oil springs will be tapped which will have the priceless advantage of yielding their riches without the agency of underground labour.[1]

W. ANDERSON.

THE CURE OF SHEEP SCAB.

THE Editor of the Journal has received the following communication, dated April 28 last, from Messrs. Wm. Cooper & Nephews, and in reference to the subjoined resolution passed by the Council

"Messrs. William Cooper and Nephews and other manufacturers of proprietary Sheep Dips having called the attention of the Council to a paper which appeared in the March number of the Journal by Mr. P. R. Gordon, Chief Inspector of Stock in Queensland, animadverting on those Dips, the Council wish at the earliest moment to announce publicly that they do not themselves accept the whole of the views expressed by Mr. Gordon with

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[1] A more extended account of Dr. Mendeleeff's theory will be found in the *Report* of the British Association for 1889 (Newcastle-upon-Tyne Meeting) in Dr. Anderson's Presidential Address to Section G (Mechanical Science), pages 727–730.

regard to these preparations, and to express their regret that they should have inadvertently given publicity, in the columns of their Journal, to statements which were not necessary for the scientific objects they had in view, and which might prove injurious to the proprietors of the preparations in question,"

the Journal Committee think it right to give this communication the same publicity as the article by Mr. Gordon to which it is a reply, but without identifying themselves or the Society with the views expressed in it, any more than with those expressed in the article itself:—

"We have read the article which appeared in your valuable Journal of March 31 last, in which Mr. P. R. Gordon gives his personal opinions upon the various preparations for the cure of scab in sheep, and in which he ventures to pass some rather severe strictures upon manufactured dips, and names our preparation amongst others. We feel sure that we may ask you to give us the opportunity of laying our opinions on the other side before your readers, so that they may form a judgment upon the question.

"Mr. Gordon can hardly have intended to convey the most obvious meaning of his remarks, that all dips, except tobacco and sulphur, and lime and sulphur, 'have been prohibited in all the colonies,' for he knows well enough there is a very large consumption of proprietary dips in the Australian colonies, and that Cooper's Dip alone is used there upon at least 20,000,000 to 25,000,000 sheep, and that its use increases largely every year.

"Scab was cleared out of those colonies in Australia, where it does not at present exist, before Cooper's Dip appeared upon the scene, but now, in Western Australia, where the disease still lingers, and where the merits of lime and sulphur, and tobacco and sulphur, are fully known, the one remedy which finds favour with the sheep-owners, and the use of which is directed by the Chief Inspector of the Colony, is Cooper's Dip. It is quite fair to infer from this that the position of Cooper's Dip would have been the same in the other Australian colonies had its merits been equally well known there when they had scab.

"We do not deny that in the hands of some people, owing to the way they use it, our dip, or any other dip, may fail, and we take it that Mr. Gordon would admit the same of his own remedies, for no man knows better than he that care and thoroughness are indispensable in curing scab.

"Is it, however, fair to conclude that a dip which has succeeded in curing many millions of sheep of scab in North America, in South America, in South Africa, where sheep are run under similar conditions to the Australian, besides all over Great Britain and other parts of the world, is to be condemned for the reason that one or two contrary instances have occurred? Surely the few should not prevail over the many. We can record hundreds of thousands of successes over a period of half a century, while every failure within our knowledge was due to lack of precaution necessary for the suc-

cessful use of any remedy, and this, doubtless, applies to all such failures.

"Mr. Gordon asserts that lime and sulphur, and tobacco and sulphur, prepared and applied as he directs, have never failed. We assert equally strongly that Cooper's Dip used as we direct has never failed, and many thousands of sheep-owners all over the world support this assertion by their own positive experiences.

"Can Mr. Gordon explain how it is that in the United States of America, where probably more lime and sulphur is used than in all other countries in the world put together—many thousands of tons being used there annually—yet in that same country scab is more rampant than in any other? Or take his other remedy, viz. tobacco, is it possible to select a single article which varies more in strength than this? In South Africa our dip is a Government remedy. The scab inspectors have to report periodically their observations upon the value of the various remedies in use there for curing scab, and it is a fact that Cooper's Dip always receives the highest commendation in these official reports. In both North and South America our dip is rapidly superseding the remedies recommended by Mr. Gordon. The enormous annual increase in our sales is pretty good proof of that.

"It may be said, 'Why, then, has not Cooper's Dip cleared scab out of these countries, as has been done in Australia?' The answer is, because their Governments have never yet adopted the stringent measures of Australia, which were so successfully carried out by Mr. Gordon and his colleagues, and some such are absolutely essential to the eradication of scab from a country. It is more the system which has made the conquest than the particular remedies used. The experience of North America, to which we have referred, where Mr. Gordon's remedy of lime and sulphur has been in general use for the past fifteen years, with the result that scab is as prevalent as ever, is ample proof of this. Armed with the Australian regulations, we would undertake to eradicate scab from any country.

"We do not deny that, as a cure for scab, lime and sulphur, properly prepared and used, may be made to cure scab, but at what cost? Mr. Gordon himself tells us, a depreciation of the wool clip to the extent of 3*d*. per pound. On the wool from 10,000 sheep that is a loss of 600*l*., in addition to the trouble and cost of dipping. Does Mr. Gordon take that into consideration, when he says that lime and sulphur is incomparably cheaper than Cooper's Dip?

"It will be at once apparent to those who have used Cooper's Dip that Mr. Gordon's comparison of the trouble of preparing lime and sulphur with that of 'Cooper' displays how small must be his acquaintance with the latter. He evidently does not know that enough Cooper's Dip for 1,000 sheep can be prepared in ten minutes without the least trouble and bother of weighing, sifting, mixing, heating, &c., inseparable from the use of lime and sulphur, and that Cooper's, used cold, cures scab. Mr. Gordon's warning that a lime and sulphur bath must never fall to a lower temperature than 110° is alone a proof of the tremendous trouble the use of such

a bath involves, for upon this basis, to dip 10,000 sheep in a lime and sulphur bath, Mr. Gordon would need at least 3,000 gallons of boiling water to make the bath of the heat he says is imperatively necessary, and there must be constant additions of hot water or special heating arrangements to maintain that temperature.

"Then with regard to the superior protective properties claimed for lime and sulphur. Mr. Gordon suggests that 'one thorough dressing effects a complete cure,' but the Government directions he quotes direct *three* separate dippings; and inasmuch as we never recommend more than two dippings with our preparation, we fail to see the superiority of lime and sulphur over our dip.

"In conclusion, we are quite willing to grant to Mr. Gordon's opinions all the weight which his ability and position properly attach to them, but as against his opinions we are surely entitled to set the very positive opinions of thousands of sheep-owners of practical experience—in some cases of from 40 to 50 years—who use our dip with perfect satisfaction. Our sales increase largely every year, and to go no further than to compare those of 1891 with those of the previous year, our accountants, Messrs. Turquands, Youngs & Co., have certified an increase, in that one year alone, of 1,140,170 packets, or over 890 tons.

"Surely, with this vast body of evidence of practical men in favour of our dip, it would be absurd and inconsistent with these times of progress to go back to the crude, cumbersome, and objectionable remedy of lime and sulphur, even if recommended by Mr. Gordon."

CUTTING BEECH WOODS.

THE recent case of Dashwood *v.* Magniac,[1] important as it is to lawyers, would seem to be no less significant to the owners of estates upon which beech trees grow, especially to the owners of such estates in Buckinghamshire, for by the custom—that is, legal custom—of that county beech trees of twenty years' growth and upwards are legally timber. Generally speaking, oak, ash, and elm of twenty years' growth and upwards are the only "timber" trees known to the law of England, but by custom other trees of that age are timber in different localities: thus in Bucks, and in certain parishes in Hants, Beds, Surrey, and Gloucestershire, beech is; in Berks, birch is; and in a parish in Hants the willow is.

The question at issue in the case was shortly this: Can the tenant for life of an estate who is impeachable for waste cut the beech woods on that estate in the usual course of management of the estate, sell them, and retain the proceeds for his own use and benefit? It was admitted that he can do so in localities where beech is not timber—*e.g.* in Oxfordshire, in which county a small part of the

[1] Reported in the *Law Reports* for 1891, vol. iii. Chancery, p. 306.

estate on which the cutting complained of had taken place is situated—because the waste for which he is liable or impeachable is cutting timber, and as beech is not timber in Oxfordshire, he could not be doing wrong in cutting it when it grew in that county. But can he cut beech trees of twenty years' growth and upwards when they grow in Bucks, where they are timber? Before stating the case and the judgments it may not be out of place, as most of the readers of the Journal are not lawyers, to clear the ground by shortly explaining what is meant by "waste," and what is the meaning of the expression "a tenant for life impeachable for or of waste."

"Waste" means the destruction of the inheritance, and when the lawyers talk about a person "committing waste" they mean a person who commits some act which is injurious to the inheritance or which destroys a part of it; for example, if the estate has fine old oaks growing upon it, those oaks form parts of the estate—of the inheritance—they are fixed and rooted in the soil, and the estate is more valuable with them growing upon it than without them. If then they are cut down, the inheritance is injured and a part of it is in fact destroyed. Now an owner who is a tenant for life of an estate does not own it absolutely but in a limited sense only. He is entitled to it for his life; he cannot dispose of it after his death, but when that happens it will belong to some one else not nominated by him. In such a case good sense as well as law renders it incumbent upon him that he should not, while he is such limited owner, commit any act whereby the estate, of which he has such limited enjoyment only, should be injured or a part of it destroyed to the prejudice of the person who is to succeed him in such enjoyment; and if he commits such an act it is but right and fair that he should be liable for the consequences of it, and make restitution to his successor so far as is possible. He is in short liable or impeachable for the act which he has committed—or to use the ordinary phrase he is "impeachable for waste." As a rule, when an estate is settled and tenancies for life in it are created, care is taken to insert apt words in the will or deed by which the settlement is effected to prevent the persons who are made tenants for life from being impeachable for waste, but in the absence of any such words all such persons are impeachable in that respect.

The facts in Dashwood *v.* Magniac were briefly these:—In 1848 Sir George Henry Dashwood, Bart., became, on the death of his predecessor, Sir John Dashwood King (who himself had possession of the estate from 1798 to 1848), absolutely entitled in fee simple in possession to a landed estate, known as the West Wycombe estate, consisting of about 5,000 acres, the much greater part of which is situated in the county of Buckingham, but a small part in that of Oxford. Sir George continued in possession of the estate from 1848 till his death in 1862. Thereupon his will, which he had made in 1855, took effect. By this will Sir George devised the estate to trustees upon trust, in effect, for his widow, Lady Dashwood, for her life, and after her death to his children, and in default of children to a nephew for life, with remainder to the nephew's son,

Edwin Dashwood (who was the principal plaintiff in the action) for life; and the will contained several ulterior devises which it is unnecessary to state. The will empowered Lady Dashwood, with the consent of the trustees, to fell timber (not being ornamental) for the purposes of repair, but it contained no provision that she should not be "impeachable for waste," and she was, in fact, so impeachable. Lady Dashwood took possession of the estate in 1862, and held it till her death in 1889. Sir George had no issue, and consequently, on Lady Dashwood's death, the estate passed under the terms of the will to the plaintiff, Sir Edwin Dashwood (his father having predeceased Lady Dashwood), who thereupon became, and is now, tenant for life of the estate. And he brought the action against the executors of Lady Dashwood to make her estate liable for timber, especially beech, which he alleged she had improperly cut. The action was heard in the first instance by Mr. Justice Chitty, who gave judgment for the defendants, that is to say, he decided that, although Lady Dashwood was impeachable for waste, yet she had the right to cut the timber and to sell it and keep the produce. In his very elaborate judgment, his Lordship is reported to have said, amongst other things, as follows:—

The argument for the plaintiffs was shortly this. Beech being timber by the custom of Buckinghamshire, it is waste for a tenant for life to cut it after it has reached the age of twenty years. When once it has reached that age it is timber and has all the incidents of timber. For the Defendants, the executors, it was admitted that beech was timber by the custom. But it was argued that there was a distinction between beech in the hedgerow, or the like, and beech in a beech wood. By their defence they alleged that in the county of Buckingham, and *separatim* in that part of the county where the West Wycombe estate is, and *separatim* in regard to the estate itself, there is a custom that all timber and timber-like trees in the beech woods are seasonable wood, and may be cut in a due course of management and at seasonable periods, and such cutting is not waste, and that the cutting complained of was a cutting in due course of management and at seasonable periods, and in accordance with the custom pleaded. For the plaintiffs it was contended that there was no such custom in fact, and that any such custom was bad in law as being repugnant to the general law relating to timber, and further that in any event the cutting was in excess of the alleged custom, and of what would be permitted by a due course of management.

The plaintiffs, and the defendants, the executors, both gave evidence in chief as to the proper course of management of beech woods generally and in the district, and also as to the course of management in the estate before the death of Sir George Dashwood; there was not much substantial difference between the witnesses on either side. The result, as I find the facts, is shortly as follows: The object of a due course of management of beech woods is to produce a continual succession of trees. With this view the woods are gone through at periods varying from eight to fifteen years, to ascertain what trees ought to be felled. The periods vary according to the nature of the soil and position of each wood. Beech grows faster and better in the bottoms than on the hills, and faster and better on slopes facing to the north than to the south. Periodical thinnings are essential to the good condition of the woods. To pass them by would seriously injure the woods. Beech trees after they have reached a certain age, varying with

the circumstances, throw mast or seed, which sows itself and which springs up naturally. The young trees throw mast; but the trees do not throw mast plentifully till they contain about twenty or thirty cubic feet of wood. Beech, which thus naturally maintains succession, differs in this respect from oak, which, although it will grow from the acorn which falls naturally, yet requires, in order that it may thrive well, assistance from the hand of man in planting. A beech ten years only is no bigger than a walking stick. At twenty years it has, say, five cubic feet of wood; at thirty, about ten or twelve; from thirty to sixty, from about forty to fifty cubic feet; between thirty and sixty it puts on wood more rapidly; after sixty or seventy years it begins to decay. The above figures as to age and cubic feet are only approximate. The growth and decay of the tree vary with the nature of the soil and situation. On a good soil and in a favourable position the decay does not begin till some time after the tree has reached the age of sixty or seventy years. Now in going through the woods periodically to see what trees ought to be cut down, the proper course is to select the larger trees and the trees that are growing awkwardly or stand in the way of other trees that are thriving and growing well. The reason for selecting the larger trees is this: The beech growing in the wood throws out a large spreading top, like an umbrella, and the large trees with their wide tops deprive the trees under them of light and air; they also injure them by the drip that falls. The other trees in the wood, whether beech, or oak, or ash, or elm, cannot grow under the shade of the larger beech trees. To cut the larger trees then is to allow the smaller trees to live and thrive, and is necessary to maintain a proper succession. To cut the smaller trees, or merely to thin the underwood, would be to destroy the rising generations, and annihilate the succession. After a given number of years, if the smaller trees were cut down a few large trees would be left standing; when these trees were cut down the place would be bare, and the wood destroyed. During the argument a metaphor was used, not inappropriately, by way of illustration; the grandfathers are removed to make way for the fathers and sons, so that they in their turn may become grandfathers and fathers, and thus each successive generation is duly brought to maturity.

In regard to the customs alleged, it was not proved that there is any such custom prevailing throughout the county of Buckingham. But in regard to the custom alleged in that part of the county of Buckingham where the West Wycombe estate is situate, it was proved that such a custom exists in the sense presently explained. This custom was shown to extend to the adjoining county of Oxford, where beech is not timber. In regard to the West Wycombe estate itself, the custom alleged was proved in the same sense. In the language of Mr. Vernon, a skilled witness for the plaintiffs, it is a magnificent estate for the growth of beech timber. The wood books of the estate from 1798 to the death of Sir George were produced and proved by the plaintiffs themselves. The cuttings of Sir George's predecessor, Sir J. Dashwood King, during the fifty years he was in possession of the estate, averaged an annual 1,709*l.*, and, taking into consideration that lower prices were then probably realisable, his cuttings exceeded those of his successors. The price of beech has since risen in consequence of the increase, particularly during the last forty years, of the chair-making industry in the district. The acreage of the beech woods on the estate is not less than 1,000 acres. During Sir George's possession from 1848 to 1862, the yearly average was 639 loads of fifty cubic feet, the maximum in any one year being 829 loads and the minimum 483 loads. The late Lady Dashwood's cuttings annually averaged during the twenty-seven years she occupied the estate 620 loads; her maximum cuttings in any one year being 853 loads, and her minimum 402 loads. The evidence of the witnesses taken in connection with the wood books

showed to my satisfaction that at least during the possession of Sir George and earlier, the beech woods were managed and cut substantially in accordance with the course of management above stated. Every wood was not cut in each year, but the woods were cut in rotation. The wood cut by Sir George and his predecessor was regularly sold by them for profit. The sales were held annually, and the wood was bought by the chair-makers for the purposes of their trade. The West Wycombe estate is situate in the centre of this industry, which extends generally to the Chiltern Hills district. Thus the cuttings in the West Wycombe woods had a close connection with the chair-making industry, and were themselves carried on as a species of trade. The trees cut, though of upwards of twenty years' growth, were in the language of the district called "poles." The chair-makers do not require very old trees for the purposes of their business; the trees cut were of an age and size most serviceable to the chair-makers.

Now, in point of law, an agricultural custom, or custom of husbandry, whether relating to the cultivation of the land, or regulating the rights and liabilities of landlord and tenant, in the absence of agreement, need not be an immemorial custom. For instance, it was recently held by the House of Lords that a custom for the tenant to take away flints turned up in the course of good husbandry, and to sell them for his own profit, was good, notwithstanding a reservation of mines and minerals, although the custom had grown up within the last thirty or forty years. Indeed, it would be absurd to carry back customs of this class to the reign of Richard I. Common usage in the neighbourhood is sufficient. It was, I think, established by the defendants that in regard to beech woods a usage had prevailed commonly in the neighbourhood, for a long period of time, of dealing with them substantially in the manner which I have already described; and also in regard to the West Wycombe estate itself, of so dealing with them for a period of at least sixty-four years before Lady Dashwood came into possession.

True it is that the title to the woods in the district was not shown—whether, for instance, the possessor was tenant in fee simple or tenant for life, impeachable or not impeachable for waste; nor was it shown whether Sir George's predecessor was tenant in fee simple or for life, with or without impeachment for waste; nor was any evidence given of disputes between landlord and tenant, or of any question having been raised between them and settled or adjusted in accordance with the alleged custom. The practice in modern times of excepting the woods from an ordinary lease renders it almost impracticable to adduce evidence of this kind. The evidence given was only of a general character; it certainly established this proposition—that whatever were their rights, whether as tenants in fee simple or for some lesser estate, the landowners in general in the neighbourhood treated the produce of their woods as income and not as capital. If, however, the West Wycombe estate is what has been called a "timber estate," the usage or custom of the neighbourhood or the district is immaterial. The evidence was ample to prove the practice on the estate itself. In the circumstances above stated the defendants, the executors, contend that the West Wycombe estate, so far as regards the beech woods, is "a timber estate," and that the profits of the periodical cuttings belong to the tenant for life, and that such cuttings are not waste. They rely on the following passage in a judgment of the late Sir George Jessel: "Once arrive at the fact of what is timber, the tenant for life impeachable for waste cannot cut it down. That I take to be the clear law with one single exception, which has been established principally by modern authorities in favour of the owners of timber estates, that is, estates which are cultivated merely for the produce of saleable timber, and where the timber is cut periodically. The reason of the distinction is

this: that as cutting the timber is the mode of cultivation, the timber is not to be kept as part of the inheritance but part, so to say, of the annual fruits of the land, and in these cases the same kind of cultivation may be carried on by the tenant for life that has been carried on by the settlor on the estate, and the timber so cut down periodically, in due course, is looked upon as the annual profit of the estate, and therefore goes to the tenant for life." In the case before me it was contended for the plaintiffs that in this passage the late Master of the Rolls was referring not to timber trees of twenty years' growth, but to underwood or the like. This contention is inadmissible; it is opposed to the obvious sense of the passage and to the plain and direct language of the learned judge, who was dealing with timber in the strict sense of the term, and with an exception to the general law. It was further contended for the plaintiffs that the statement was a mere dictum; that it is not supported by authority, ancient or modern; that it is contrary to principle, and that it is not law; but it appears to me that I am not at liberty to refuse to follow this deliberate statement of the law unless I am convinced that it is erroneous, which I am not.

The learned Judge then discussed various old authorities, and in the result held that not only the beech trees, but also the oaks, ashes, and elms that had been felled by Lady Dashwood in the management of the woods, as above described, had been properly felled, and that Lady Dashwood had not exceeded her rights, nor were her executors accountable to the plaintiff for the timber which she had so cut down.

The defendants appealed from this decision, and the appeal was heard by Lords Justices Lindley, Bowen, and Kay. The two former agreed with Mr. Justice Chitty, but Lord Justice Kay did not. In his Lordship's judgment, the usage which had been proved as to the mode in which the woods in Buckinghamshire had been treated could not control the ordinary law of waste. Such usages applied to cases between landlord and tenant or to other persons who had contracted with each other, but not between a tenant for life and remainder-man. Custom, that is an immemorial or prescriptive custom alone, could control the law of waste, and to substantiate their defence in this respect the defendants ought at least to have proved that from time immemorial a limited owner, though impeachable for waste, had been accustomed to exercise the right to cut the timber in the way in which Lady Dashwood had cut it. But there was not the slightest evidence that any limited owner who was impeachable for waste ever attempted to exercise any such right, and the usage for absolute owners to manage the woods in the way in which the woods of the West Wycombe estate had been managed could not justify a limited owner so impeachable in doing the same. His Lordship's judgment then contained the following passage, which I cite at length, because it seems to me to be of great importance as regards agricultural customs or usages:—

It was argued, however, that the evidence establishes not a custom for a limited owner so to cut timber, but a usage of management so universal in the county of Bucks that the testator must have intended that Lady Dashwood should continue it during her life.

There is no evidence that this usage is immemorial.

A usage, though not immemorial, for farm tenants in a particular locality to cultivate their farms in a special manner, may be read into the contract between such a tenant and his landlord, if not repugnant to anything in the contract, or contrary to law as fixed by statute or decided cases.

This case differs in the following particulars:—

1. A devise of an estate to a limited owner is not a contract.

2. There is no evidence of a usage for limited owners impeachable of waste to cut timber in the manner which is in question.

3. To do so, if waste, is directly repugnant to the nature of the gift in this will.

4. It is a violation of the common law to say that a limited owner impeachable of waste may cut timber in this manner.

The Lord Justice then, in a most learned and elaborate judgment, discussed the further contentions of the defendants that the cutting the timber was not waste because (1) the West Wycombe estate was a "timber estate," and because (2) the wood cut by Lady Dashwood was "seasonable wood," which according to ancient authority might be cut by a limited owner. "What," said his Lordship, "is a timber estate?" Counsel for the defendants disclaimed the definition that it means an estate upon which there is a good deal of timber. A timber estate, they say, is an estate upon which timber is cut periodically to allow a succession to grow up, but this does not agree with Sir George Jessel's definition. He defined such estates as "estates which are cultivated merely for the produce of saleable timber and where the timber is cut periodically." If the latter means that nothing else is cultivated on the estate, there are few, if any, such estates in this country. But if not, how much of the estate must be so cultivated to make it a timber estate? It must be a considerable portion, but the portion is not defined. The difficulty of defining a timber estate was, in his Lordship's opinion, a serious if not fatal objection to the modification of the law of waste in regard to such an estate. And another equally serious objection was that there was no necessity for any such an innovation, for a settlor could always empower a limited owner to cut the timber in the way complained of in this case, even if he did not wish to render the limited owner generally unimpeachable for waste, yet he could use such words as these to effect his wish "without impeachment of waste for such cutting of wood as has been usual upon the estate."

Nor, in his Lordship's judgment, was the cutting to be justified on the ground that the wood cut by Lady Dashwood was "seasonable wood" or *silva cædua*, because the wood cut was timber, and seasonable wood or *silva cædua* meant wood which is cut down at different periods and which springs again from the same root or stool, that is to say, coppice and not timber. His Lordship summed up the conclusions to which he had come as follows:—

(1) That Lady Dashwood was impeachable for waste. (2) That cutting

down timber trees of 20 years of age and upwards by such a limited owner is waste. (3) That such waste is not excused because it may benefit the other trees or saplings, or may cause seeds of timber trees to germinate in the woods. (4) That there is no exception from the common law on this subject in favour of the limited owner of what is called a "timber estate." (5) That a custom to control the common law in this respect must be nothing less than an immemorial custom to commit such waste. (6) That there is no evidence in this case of any such custom. (7) That the usage proved is only that owners not impeachable of waste have adopted a mode of managing the woods which would be waste on the part of a limited owner impeachable of waste.

The majority of the Court being in favour of the judgment of the Court below, the appeal was dismissed.

An appeal from the above judgment was presented to the House of Lords, but has been compromised.

S. B. L. Druce.

SMALL HOLDINGS IN CORNWALL.[1]

It is not the purpose of this paper to discuss the provisions of any recent Act of Parliament, but rather to assign some reasons in favour of the general principle that small agricultural holdings may advantageously be made more numerous.

During the last twenty years there has been a large increase of population in the towns, but a decrease in the rural districts; the last census showing the process to be still in progress. Obviously this is a matter of national importance. It implies that yearly a larger quantity of food is needed; also that the number of food producers is lessening.

If we refer to our Import Returns we shall find that the importation of almost every article of food is increasing at a rapid rate, but that the principal increase is in wheat, flour, and dead meat.

So long as our present commercial supremacy is sustained and our trade continues to expand, there may not be any serious inconvenience arising from this state of things; but whenever our trade declines and our purchasing power is diminished, or if from any cause our foreign supplies are curtailed, the nation at large will

[1] The writer of this paper is favourably known to us as winner in the farm competition of 1890 of the first prize in Class III. (farms over 40 and under 100 acres. (See Journal, Third Series, Vol. I., 1890, p. 812.) The Judges' report on this farm is worthy of study. Of the farmer they say enterprise, dogged determination in surmounting difficulties, are his characteristics; his success has naturally secured for him many followers. Yet this case is quite exceptional. Specially favoured by existing usage, the circumstances of the locality are also altogether favourable; besides Mr. Lawry himself "is one in a thousand!" Few are the men in his rank of life with the same abilities, persevering energies, and shrewd intelligence, and rarer still are the occasions when such men confine their attention to a few acres of land. As a representative man closely in touch with the class recent legislation is designed to benefit we gladly give Mr. Lawry's paper a place in the pages of this Journal.—C.

realise that it has been a great mistake to allow agriculture to decline.

We should probably in such circumstances have hasty, ill-advised, and drastic legislation affecting the land, which timely action might have avoided.

The avowed purpose of increasing the number of small holdings is to endeavour to increase the proportion of the population who shall live on the land. That this is desirable all are agreed; people only begin to differ when plans are proposed to accomplish it.

Some few persons maintain that the best plan would be to reimpose such a tax on imported wheat and flour as should again make it profitable to grow wheat. In this case it is said a far greater number would be employed on the land.

Another plan of accomplishing the same object is that of providing a sufficient number of small holdings, to be occupied, as tenants or prospective owners, by the most energetic and thrifty of the labourers.

It is of this plan, as it is now before the public, that we wish to inquire, Is it economically sound and socially desirable? Can it be proved that food cannot be produced as plentifully and as cheaply on small holdings as on large ones? If so, whatever other reasons may favour their establishment, they would be commercially a failure.

At first sight it would seem that this must be the case, seeing that small holdings, relatively to large ones, require a larger outlay on buildings, and consequently must pay a proportionately higher rent; also that on small holdings it will not pay to purchase the various expensive labour-saving appliances which prove such an economic advantage in the cultivation of large farms. On examination, however, these disadvantages are more than counterbalanced by the advantages of a closer personal supervision, and the fact of the larger proportion of the labour, frequently the whole of it, being performed by the occupier and his family, all of whom have the utmost possible interest in the success of the undertaking. This is an advantage that can be fully appreciated by those who have to depend on hired labour; and seeing that all the expensive machinery required, such as steam threshing-machines, can always be hired on reasonable terms, it far outweighs the disadvantage of a few shillings per acre additional rent.

There are other considerable advantages which small holdings have over large ones. It will be admitted that they are best adapted for dairying, the rearing of cattle, and the production of pork, poultry, and eggs; also for the growth of vegetables, fruit, and flowers, inasmuch as these operations require a larger amount of skilled labour and personal supervision than the growth of cereals, and the production of mutton, beef, and wool.

It is obvious that if a large holding were devoted to the raising of vegetables, fruit, and flowers, a number of experts would be required to superintend the various departments. These would require a high rate of wages, and after all would lack the direct interest in the

success of the work which is indispensable in order to secure the best results. Or—if dairying were the principal thing—on a large holding, say of 600 acres, every practical man knows the difficulty experienced in getting from 150 to 200 cows properly milked on Sundays as well as week days; but let this holding be divided into twelve or more, and the occupiers and their families will do the principal part, if not the whole of this work, and do it efficiently and without complaint. So also with reference to poultry raising and the production of eggs; small enclosures, affording variety and shelter, are better than the large ones found on large holdings. In this matter, as in all the other operations specially adapted to small holdings, the constant personal part taken in the work by the occupier or members of his family is an advantage that will be appreciated most by those occupiers of large holdings who realise the difficulty, uncertainty, and generally unsatisfactory results, when such matters have to be entrusted to hired labourers.

It is further to be noted that the products specified do not suffer so seriously from foreign competition as do the products best suited to large holdings. Notwithstanding the heavy imports of butter, cheese, and eggs, the foreigner cannot compete with us in supplying the increasing demand for milk and cream, and the local demand for the best quality of home-produced butter and new-laid eggs. Then as regards soft fruit, fresh vegetables, and cut flowers, we have the natural protection afforded by the importers' inability to bring such articles here in a perfectly fresh condition, so that, other things being equal, the same products grown at home always command a considerably higher price.

These facts, namely, that the commodities best adapted to be produced on small holdings require more skilled labour and personal supervision, and suffer less from foreign competition than do those best suited to be produced on large holdings, are economic advantages that should make small holdings a complete success. We are, however, met with the reply that, where they already exist, this success has not been generally attained. This may be so, and too often the cause is not far to seek. The demand for small holdings has been generally beyond the supply; hence the price paid for them has often been from 50 to 100 per cent. more than that paid for land of the same quality let in large holdings. An assistant overseer to whom I am indebted for the statistics of his parish, given on page 394, remarks with reference to small holdings in that parish: "The rent of our farms of 50 acres and upwards is about 1*l.* per acre, and of those below, including those under 5 acres, the average price will be considerably more per acre. Small holdings here have, as a rule, punished the steady, industrious labourers who have tried them; but as soon as they get tired of them, there are others ready to try, and so the rents are, by competition, kept too high for the occupiers to get a sufficient remuneration for their labour."

Another correspondent, who has a wide experience in connection with an Assessment Committee, says: "I find, as a general rule, that

the small occupiers hold under needy owners, or owners who take from them a rent out of proportion to the real value of the land. The land is consequently impoverished, the houses and buildings are dilapidated, and the occupiers are often in worse circumstances than farm labourers, and it seems to me that the only person who is benefited is the owner who gets an excessive rent. These very strong indictments show that the mischief, the break-down, is caused by the demand being so generally in excess of the supply, that rents are paid which altogether preclude the possibility of general success."

The remedy for this is to increase the supply of small holdings until the demand is met, when rents will find their proper level. Such facts as the foregoing do not by any means prove that small holdings are necessarily a failure, but simply show that in some cases they can only be obtained on terms so ruinous as to prevent success.

Whilst, however, in many cases failure has resulted from the land being rented too dearly, the statistics we give on page 394, relating to East Cornwall, presumably show that by means of small holdings a considerable percentage of those who, themselves or their fathers, were once labourers, have succeeded in becoming occupiers, not only of small holdings, but also of large ones. Notwithstanding all the difficulties that have surrounded them in the past, such as their scanty earnings, their lack of education, and the general high prices they have had to pay for the land, it is surprising to find that so many have succeeded, and presumably they may be taken more or less nearly to represent that which prevails in those parts of the kingdom where small holdings form a considerable proportion of the entire number.

The first four parishes mentioned are purely agricultural; the second four have a small proportion of the population engaged in mining. No return received has been suppressed or altered to suit any purpose or theory, as the writer's object is simply to present the facts as he finds them.

In the first group, the first parish cited, St. Germans, has a railway running through it, and is within about six miles of Devonport by road or water; it has a fertile soil, and good climate, and withal possesses a large proportion of small holdings; yet on the 73 holdings it has not one of the occupiers who was himself either a labourer or a labourer's son. The only explanation that can be suggested is the circumstance of being so near Her Majesty's Dockyard, and Devonport being a great naval centre the young men are attracted either to the dockyard or to the navy.

That it may be seen to what extent small holdings exist and the proportion they form with respect to large ones, we have arranged the holdings in three classes, viz., from 5 to 50 acres, from 50 to 100 acres, and from 100 acres upwards, giving in the next column in each class the number of present occupiers who were formerly labourers or are the sons of labourers. It will be observed that the second group of parishes, having part of the population engaged in mining, shows the highest percentage of occupiers who were once labourers or are the sons of labourers.

Parish	No. of Holdings from 5 to 50 acres	No. of Occupiers once Labourers or sons of Labourers	No. of Holdings from 50 to 100 acres	No. of Occupiers once Labourers or sons of Labourers	No. of Holdings from 100 acres upwards	No. of Occupiers once Labourers or sons of Labourers	Percentage of Occupiers once Labourers
(1) Entirely agricultural							
St. Germans	36	0	9	0	28	0	0
St. Keyne	15	5	9	3	24	6	29·16
Pillaton	7	2	7	1	7	1	19·04
St. Dominic	30	11	12	3	8	2	32
(2) Partly mining							
St. Ive	45	36	11	5	16	6	65·27
Callington	33	8	13	0	3	0	16·32
Menheniot	14	6	11	2	29	2	18·51
South Hill	36	4	10	2	10	2	14·28
Total . .	216	72	82	16	125	19	

These figures show that slightly over half the holdings in this part of East Cornwall are between five acres and fifty, and that one-third of them are occupied by those who were once labourers or are the sons of labourers; and that of the next class, viz., holdings between fifty acres and a hundred, about one-fifth of the number are so occupied, whilst of holdings of over one hundred acres, nearly one-sixth are occupied by those who were once labourers or are the sons of labourers. The total number of holdings of all sizes above five acres is 423, and the total number of occupiers who were labourers or are the sons of labourers is 107, or about one-fourth of the whole.

The other point we propose to consider in connection with the increase in the number of small holdings is the social advantage it offers.

The evil sought to be mitigated, if not entirely overcome, is the depopulation of the rural districts. One of the chief causes inducing the smartest labourers to leave the country districts is the fact that they see only a remote chance of advancement if they remain. Small holdings are frequently so few, compared with the number who desire them, that it is a tiresome thing to wait the chance of getting one on anything like reasonable terms. Without such a tenancy as a stepping-stone to something better, labourers feel that nothing remains for them if they stay on the land but to be labourers all their days. They consequently determine to seek their fortunes elsewhere. Many emigrate, others migrate to the towns, thus leaving the rural districts poorer, not only in men, but in young men of ambition, energy, and thrift,—young men, who, if a fair chance, in the first instance, had been afforded them by a better supply of suitable dwellings (those now in existence being too often insufficient in number, and many of them totally unfit for human habitation), and in the next by a sufficient supply of small agricul-

tural holdings, might fairly hope to be able to get a holding on reasonable terms, and thence push their way up until perchance they might ultimately become occupiers of large holdings, or possibly owners of the land. Who can estimate the advantage to agriculture, and the social elevation of the rural districts, that would result if such persons as these were induced to remain ?

In manufactures, trade, and commerce, what advantages have been derived from those who were once operatives or clerks, who by their exceptional abilities rose to be millowners, tradesmen, or merchants, inventing new appliances and devising more economical methods, the adoption of which has revolutionised the particular calling into which they had made their way !

May we not expect that similar results will accrue to agriculture, when, by the extension of small holdings, the smartest young men of the labouring class will be retained on the land ? There may be some persons who have such a poor opinion of them, as to be unable to conceive that agriculture can ever benefit if they are retained on the land and become occupiers or owners. Probably they forget that an elevating process has commenced and is proceeding at an accelerated speed, and that in consequence the labourers as a class are no longer the stolid, unintelligent, unambitious men they once were.

In the past they were neglected and their grievances unheeded ; but the times have changed ; their votes now count at an election.

If the improved labouring class have grievances, or desires of advancement, the former are promised to be redressed and the latter gratified, until there is apparently some danger of their receiving so much attention that they may think that theirs is the only interest to be studied. Coexistent with this is the fact of their better, and still improving, educational advantages. Labourers now read the daily newspaper at the village reading-room, they discuss social and political questions, they observe the wages that are being earned in other fields of labour, they are well abreast of the eight-hours question, and the result of the combined influences which have been brought to bear on them is that they are not satisfied with their present lot and future prospects. Old age pensions would doubtless be a welcome substitute for the workhouse, and an increase of small agricultural holdings, brought within the labourers' reach, would go far towards removing the disability that at present exists, and would stimulate many of them to greater efforts in order that they might improve their position. This conduct on the part of some would be likely to act beneficially on many others, and so the general condition and status of the agricultural labourer would be perceptibly improved.

If this result is attained there follows the necessary conclusion that pauperism in the rural districts will be diminished.

We doubt if such an increase of small occupiers would, on the whole, lessen the number of hired labourers required on the land, or lessen their supply.

On many large holdings, for lack of capital, or security for the capital that should be invested, the amount expended on labour is insufficient to secure the best results. By reducing large farms,—carving out of them small holdings,—the farmer in most cases could, as before the reduction, profitably continue the same expenditure on labour.

It only remains to inquire what will be the probable social effect on the towns. If by the increase of small agricultural holdings young men are induced to remain in the rural districts, instead of as hitherto migrating to the towns, one of the first effects must be to lessen the competition there for work, with the result that a large number now unable to find employment, living in destitution and wretchedness, at once a disgrace and a menace to our civilisation, would be able to obtain it.

The general effect on pauperism should be materially to lessen its percentage. According to a Parliamentary Return recently published, there are in England and Wales 99,534 able-bodied paupers, the large majority, we presume, being found in our towns and cities. The general effect of retaining the rural population in the country should be to materially lessen this number.

Possibly it may be asked, "What would be the effect on the great body of present occupiers of land? Already in many, nay in most parts, there is a real scarcity of efficient agricultural labourers and servants. If the best are enabled and induced to become occupiers on their own account, will not this make matters worse?"

We think the contrary effect would follow,—that a better supply of efficient labour would result from any measures that made the rural districts more attractive. Of such measures, the provision of a sufficient supply of small agricultural holdings is one, and the provision of better dwellings is another.

Evidently a system that would retain young men in the rural districts, and offer them inducements to work their way up to a better position, would be an immense advantage to all concerned, especially as compared with the present system, the tendency of which is to drive the most energetic and enterprising of the labourers away from the land.

J. W. Lawry.

RECENT AGRICULTURAL PUBLICATIONS.

The works which form the subject of this notice are all of foreign origin, two of them being translations. They are reviewed in the following order:—

1. Parasitic diseases of animals.
2. Agricultural chemistry in France.
3. The external form of the horse.
4. Guides to the age of live stock.
5. Animals injurious and useful in agriculture.

PARASITIC DISEASES OF ANIMALS.[1]

Parasitism, with the diseases incident thereon, affords an almost limitless field for study, and is steadily attracting an increasing number of specialists within its domains. The appearance in English dress of the well-known treatise of Neumann may be taken as an indication of the growing interest manifested in the subject in this country, whilst the presence of Dr. Fleming's distinguished name upon the title-page is an unquestionable guarantee of the care which has been bestowed upon the difficult task of translation and annotation.

Comprehensive as the volume is, it has not been found practicable, in dealing with the parasitic diseases of our domesticated animals, to include those very small and subtle parasites usually designated "microbes." On the other hand, the diseases discussed are nearly all associated with the presence of relatively large parasites—of those the distinctive characters of which can fairly well be recognised without the aid of the microscope.

In an introductory essay on parasitic diseases in general, it is pointed out that the *state of the surroundings* in which the domesticated animals are placed may favour or hinder the multiplication of parasites. Animals whose skins receive but little attention are liable to the attacks of lice and scab-pests; and those which are clipped have more chance of escaping them. Crowded and dirty habitations aid in the propagation of parasites. The Herbivora (cattle, sheep, &c.), which live at pasture, alone harbour the larvæ of the Œstridæ (ox warble-fly, &c.); butchers' and shepherds' dogs are the favourite hosts of certain tapeworms whose alternating bladder-worm, or cystic, life is passed in the tissues of Herbivora.

As regards the names applied to parasitic diseases, they were formerly given with reference to some important symptom,—such are the terms *scab* or *mange*, *red mange*, *ringworm*, *herpes*, *favus*, *rot*, *measles*, *gid* (*hoose*), &c. At present the general tendency is to designate each parasitic disease by a word the root of which is obtained from the name of the genus to which the parasite belongs, and the termination of which is furnished by *asis* or *osis*. Thus, *Phthiriasis* (from φθείρ, a louse) is a general name for the cutaneous disorder due to the presence of lice on the surface of the skin (lousiness). *Acariasis* includes all the diseases caused by Acarina or Acaridæ, which embrace the ticks, wood-mites, and scab-pests. *Trichinosis* is the disease induced by the presence in the muscles or the intestines of the thread-worm, *Trichina spiralis* (Fig. 1).

In combating the ecto-parasites—those that infest the outer surfaces of the body—the animals attacked should be isolated, and the

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[1] *A Treatise on the Parasites and Parasitic Diseases of the Domesticated Animals.* By L. G. Neumann, Professor at the National Veterinary School of Toulouse. Translated and edited by George Fleming, C.B., LL.D., F.R.C.V.S. Pages xxiii + 800, with 365 illustrations. London: Baillière, Tindall, and Cox. 1892.

place they occupied scrupulously disinfected, boiling water being recommended as the best agent for the latter purpose. For endo-parasites—those that infest the internal organs of the body—the remedial measures should be determined by what is known as to the mode of introduction of the pests. The purity of the water supply should in particular be attended to. Avoidance of such watering places as ponds, streams, cisterns, &c., into which rain water passes, is necessary if these receive and retain various dejections containing germs of parasites. In the exercise of precautions against some of the heteroxenous parasites (*i.e.*, organisms which require more than one animal "host" in order that they may complete the cycle of changes that make up their life history), it is desirable to keep away the definitive host; for example, dogs should not be allowed

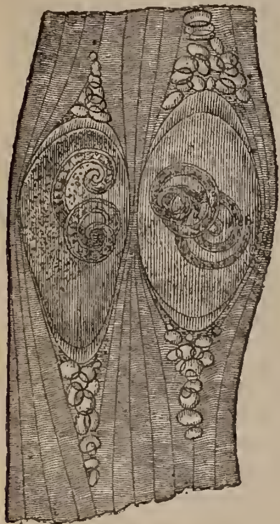

FIG. 1.—Trichinæ encysted in muscular tissue. The cyst on the right contains two Trichinæ.—Colin.

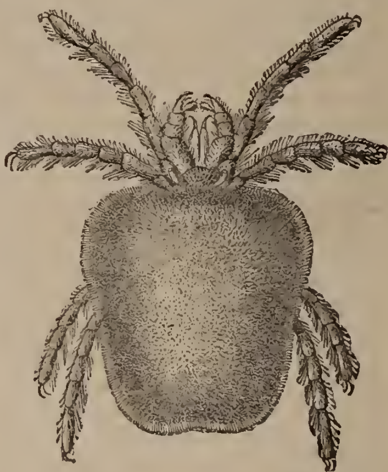

FIG. 2.—*Trombidium holosericeum*, Linn. Female, seen from above; magnified twenty diameters.—Railliet.

to eat the heads of sheep which have died of "gid;" flocks of sheep should be kept away from dogs which have tapeworms; sheep should not be allowed to graze in damp pastures where they may find snails infested with the cercaria of flukes.

The body of the volume comprises eight books, which deal respectively with the following subjects:—

I. Parasites of the Skin (298 pages). The two-winged flies (Diptera), the fleas, phthiriases, acariases (Figs. 2 and 3), summer-sores of horses, verminous foot-rot of sheep, &c.

II. Parasites of the Digestive Apparatus (230 pages). Parasites of the mouth and pharynx, including thrush in calves, foals, and poultry, and diphtheria in fowls. Parasites of the gullet, stomach, intestines, and liver.

III. Parasites of the Serous Membranes (10 pages).

IV. Parasites of the Respiratory Apparatus (61 pages), including the nasal cavities and larynx, the windpipe, bronchi and lungs. Husk or hoose in calves and lambs (strongles, Fig. 4). Red-worm or forked-worm in pheasants.

V. Parasites of the Circulatory Apparatus (32 pages). Infusoria and thread-worms in the blood of the horse. Blood parasites of ruminants, rodents, dogs, and birds.

VI. Parasites of the Muscles, Connective Tissue and Bones (76

FIG. 3.—Harvest Bug, the larva of *Trombidium holosericeum* (Fig. 2), seen from below; magnified 100 diameters.—Raillict. ["The Harvest Bugs attack the small Mammalia by preference, such as moles and hares, which are sometimes literally covered with them; and man is often invaded by them in the autumn, the insects creeping rapidly along the limbs, and fixing themselves on any part of the body, especially those parts which are clothed. Their punctures are accompanied by insupportable itching."—Page 107.]

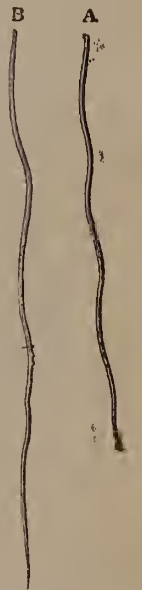

FIG. 4.—Strongle of the sheep, *Strongylus filaria*, Rud.; natural size. A, male; B, female.

pages). Various bladder-worms and thread-worms. Measles of the pig, dog, and ox. Trichinosis (Fig. 1).

VII. Parasites of the Nerve Centres and Organs of Sense (35 pages). Hydatido-cephalus, or "gid." Parasites of the ear and eye.

VIII. Parasites of the Genito-urinary Organs (25 pages).

As an example of the kind of information furnished by Neumann, the following details concerning a malady well known to flock-masters are derived from various parts of the volume.

GID IN SHEEP.—Hydatido-cephalus, or "gid," is exclusively due to the presence in the nerve centres, and particularly in the brain, of *Cœnurus cerebralis*, which is the bladder-worm stage of the tape-worm, *Tænia cœnurus*, of the dog. It is common in the sheep, less frequent in the ox and goat, and quite exceptional in the horse. The malady appears to be not so prevalent in England as formerly, though in certain seasons it may cause considerable damage, sometimes as many as 35 per cent. of the flock being lost. In addition to gid, the disorder has received such names as turnsick, turnside, sturdy, goggles, turn, blob-whirl, giddiness, punt, hydatid on the brain.

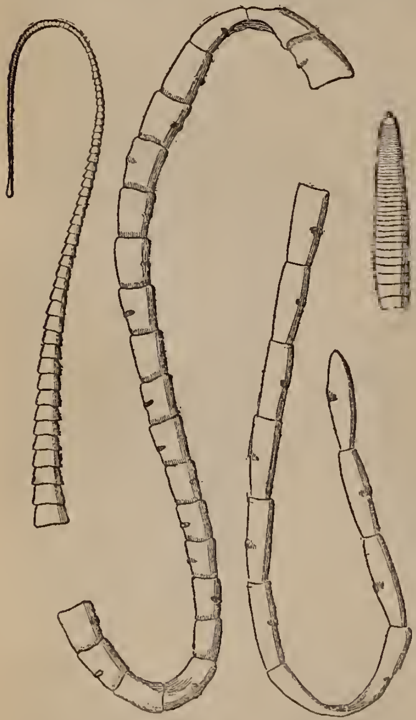

FIG. 5.—*Tænia cœnurus*, Küch; natural size.

Gid has its origin in the *Tænia cœnurus* (Fig. 5) of the dog. The mature segments of this tapeworm, gorged with ova, are expelled with the excrements, and fall upon the herbage of the pastures where the dog wanders beside the ruminants which he guards. The segments, decomposing on the ground, allow the contained ova or eggs to escape, and the rains disseminate these over the grass, or wash them into ditches or ponds from which animals drink. As humidity favours the ova, gid is more common in flocks that frequent damp pastures, and also when the spring and summer have been rainy. Lambs and boggets are chiefly affected, the disease being of exceptional occurrence in sheep of more than two years old. When a lamb swallows the ova of *Tænia cœnurus*, the shells of the minute eggs soon dissolve in the gastric juice, and the embryos are set free. Aided by their six hooks, the latter pass through the walls of the stomach or intestine, wander among the tissues, very probably penetrate some vessel, and are carried in the current of the blood to various parts of the body. Those which arrive at the nerve centres are almost the only ones to pursue their development. They then lose their hooks, and are transformed into vesicles that gradually acquire the character of the bladder-worm, *Cœnurus cerebralis* (Fig. 6).

If several lodge themselves at one time in the brain cavity, the first symptoms of gid are usually observed at from the eighth to the twentieth day. When the heads of sheep, dead from gid, are devoured by dogs, the bladder-worms of the sheep's brain change to the tape-worm, *Tænia cœnurus*, inside the dog.

The symptoms of cephalic gid in the sheep are, at the outset, indifference and weakness, accompanied by an abnormal attitude of the head. Sometimes, when there is simultaneous invasion by a large number of bladder-worms, the symptoms become exaggerated. The head grows hotter, and pressure on it causes pain ; the pulse is more frequent, and, acting under irresistible impulse, the animal performs automatic movements, forward, to the right or left, in a circle, or rotary on one spot, pivoting round a vertical axis passing between the collected four limbs. In other cases the animal acts as if intoxicated, and often stumbles and falls. At the same time the eyes are deviated inwards or outwards, the neck is contorted, there is grinding of the teeth, the mouth is foamy, and convulsive contractions seize the limbs. This kind of vertigo—the precursor of

FIG. 6.—*Cœnurus cerebralis*, after being kept in alcohol.

FIG. 7.—Sheep's Nostril Fly. *Œstrus ovis*, Linn. (*Cephalomyia ovis*, Latreille); natural size.

gid—is rarely continuous, but most frequently intermittent. At the end of four or six months the real symptoms of gid appear. The sheep becomes feeble, gradually loses its appetite, and lags behind the flock or does not follow at all. When the parasite occupies the surface of one of the hemispheres of the brain, the animal describes circles which become smaller and smaller, until at last, pivoting on itself, and with the straw, hay, or grass twisted around its feet in consequence, it falls down. In other instances the circles become extended. Some sheep go straight forward, lifting their feet high, and holding the head low and close to the chest ; these are called *trotteurs* in France, *traberen* in Germany.

The malady under discussion must be carefully distinguished from *false gid*, which is produced by the larvæ or maggots of the two-winged fly, *Œstrus ovis* (Figs. 7, 8, 9), lodging in the cavities in the frontal bone of the sheep's skull, to which they gain access through the nostrils. When affected with this "grub in the head" the sheep does not move in a circle, whilst there is nearly always snorting, accompanied by a discharge from the nose.

In consequence of the serious nature of gid and the unsatisfactory results of treatment, nothing is done to cure affected sheep, which are usually sent to the butcher. But special reasons, chiefly relating to the value of individual animals, may present themselves in favour of curative treatment, methods of which are described in the volume.

What is more immediately to the interest of the flock-master is to prevent, if possible, the appearance of gid. With this object it is recommended that the number of dogs should be kept at a minimum. At least once a year, at the beginning of spring, dogs should be freed of tapeworms. For this purpose a tæniafuge, consisting of two to eight grammes, in capsule or pill, of the ethereal extract of male shield fern, administered after a twenty-four hours' fast, usually produces a prompt result. If the dog is kept by himself, the expelled Tæniæ may be collected and burned. The heads of sheep which have suffered from gid should be boiled or burned, and never left to dogs to eat. It is further suggested to prohibit the use, by young sheep, of certain wet pastures where the germs of gid are more particularly preserved.

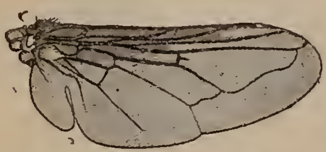

FIG. 8.—Wing of *Œstrus ovis*, Linn. (*Cephalomyia ovis*, Latreille); magnified five diameters.—Railliet.

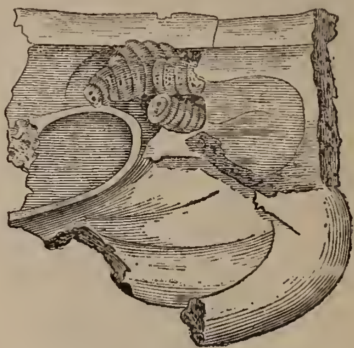

FIG. 9.—Larvæ of *Œstrus ovis* in the hollows behind the frontal bone (the frontal sinuses) of the sheep's skull.

Through the courtesy of the publishers we give the foregoing specimens of the illustrations in Neumann's "Parasites."

By his translation of this masterly work, Dr. Fleming has been enabled to fill an obvious void in English technical literature. Whilst Spencer Cobbold, Andrew Murray, and other writers have left behind them useful treatises on one or another branch of the subject, there is no work that can approach that of Neumann either in comprehensiveness or in completeness. There is reason to believe that the distinguished Honorary Member of our Society, the translator and annotator of Neumann, entertains the very highest opinion of the author's work. Probably there is no other treatise of the kind, not even in human medicine, which can approach it, so that it is certain to benefit in a high degree both agricultural and veterinary science. It is capable of giving a great impetus to the study of helminthology and allied subjects in all English-speaking countries, and may thus aid in the extinction of parasitic diseases in man and beast. All who seek information upon the subject of

parasitism, whether lay readers or professional, will therefore welcome the appearance of this English edition. It adds one more to the many obligations under which Dr. Fleming has placed students, practitioners, and general readers, who are already indebted to him for his well-known works on "Veterinary Obstetrics," "Operative Veterinary Surgery," "Animal Plagues," "Roaring in Horses," and other subjects, besides his invaluable translation of Chauveau's "Comparative Anatomy of the Domesticated Animals."

AGRICULTURAL CHEMISTRY IN FRANCE.[1]

On a first glance at this work the reader is surprised to find that, although it is issued under the comprehensive title of "A Treatise on Agricultural Chemistry," it yet contains no sections dealing with animal chemistry, or with the ever-widening subject of the chemistry of the dairy. The author, in his preface, does not offer any explanation of this circumstance, but it is apparent that he regards agricultural chemistry as embracing the chemistry of plants, soils, and manures. As is the case with so many French treatises, the value of this volume, great as it undoubtedly is, suffers from the omission of an alphabetical index. The absence of this is only partly compensated for by a full synopsis of contents, which extends over upwards of twenty pages.

M. Dehérain's name has long been favourably known in this country as that of one of the leaders of agricultural science in France. His experience as Professor of Vegetable Physiology in the Museum of Natural History, and as Professor of Agricultural Chemistry in the School of Agriculture at Grignon, has endowed him with special qualifications for the production of a work such as that under notice. As illustrative of the manner in which they do these things in France, it is likely to prove interesting and suggestive to English readers, whether farmers or pupils, to present in a condensed form the leading features of M. Dehérain's synopsis, and thus to afford a view of the subject of Agricultural Chemistry as taught in a country where, for well-nigh a century, it has never lacked ardent students.

The work is made up of three parts, dealing respectively with (I.) The Growth of Plants, (II.) Soils, and (III.) Manures and Manuring.

Part I.—The Growth of Plants.

1. *Germination.*—The selection of seed and its treatment before sowing. The conditions of germination as determined by moisture, air, temperature, light, and electricity. Changes in the air which is in contact with germinating seeds. Relation between the carbonic acid gas evolved and the atmospheric oxygen absorbed. Chemical

[1] *Traité de Chimie Agricole.* Par P. P. Dehérain. Pages xi + 904, with 54 illustrations. Paris, G. Masson, 1892.

analysis of the seed, and its percentages of ash, fat, sugar, gum, starch, cellulose, albuminoids, and amides. Changes during germination. Germination of tubers (potato, Jerusalem artichoke) and bulbs. Formation of buds of perennial plants.

2. *Assimilation of Carbon.*—Characters of chlorophyll, the green colouring matter of plants. Decomposition of carbonic acid by green plants ; influence of the condition of the leaf ; different action of the two sides of the leaf ; influence of the composition of the atmosphere. The decomposition of carbonic acid by the leaves is the origin of the organic matter in the soil.

3. *Assimilation of Nitrogen*, whether in the form of nitrates, of ammonia, or of organic matter. Rôle of atmospheric nitrogen. Fixation of ammonia and of nitrogen in the soil. Fixation of atmospheric nitrogen by leguminous plants (experiments of Hellriegel and Wilfarth, and of Bréal).

4. *Mineral Composition of Plants.*—Quantities of ash left by leaves, wood, roots, stems. Chemical ingredients of plant ashes ; modes of estimation.

5. *Mineral Nutrition of Plants.*—Influence of various mineral ingredients—phosphoric acid, potash, lime, magnesia, chlorides, silica.

6. *Assimilation of Mineral Matters.*—Conditions in which mineral substances exist in plants. The process of diffusion. Accumulation, in the leaves, of substances soluble in water charged with carbonic acid, but insoluble in pure water.

7. *Respiration.*—Conditions which regulate its activity. Oxygen essential to the life of plants. Influence of the composition of the atmosphere upon the production of carbonic acid. Heat arising from plant-respiration. Matters consumed in respiration. Comparison of respiration with assimilation.

8. *Constituents of Plants.*—Carbo-hydrates : sugars, gums, dextrins, starches, celluloses. Ternary compounds, other than carbo-hydrates : fats, tannins, vegetable acids (oxalic, lactic, malic, tartaric, citric), volatile acids (formic, acetic, butyric), resins (caoutchouc, gutta-percha, turpentine), essences (of rose, jasmin, orange, &c.). Nitrogenous compounds : alkaloids (nicotine, morphine, quinine, strychnine, &c.), amides (asparagine, leucine, tyrosine, glutamine), albuminoids (vegetable albumin, vegetable casein, gluten).

9. *Movement of Water in Plants.*—Absorption of water by roots. Ascent of water in the vessels of plants. Transpiration (or evaporation from leaves) : its extent in different plants, its amount compared with absorption ; influence of the age of the leaves, of direct or indirect sunlight, and of different hours of day and night. Effect of transpiration in the distribution of species.

10. *Growth and Maturation.*—Predominance, in the development of herbaceous plants, firstly, of the root, and secondly, of the leaf, followed by flowering and ripening. Changes during ripening. Migration within the plant of nutrient substances. Accumulation of reserve materials. Ripening of woody plants.

Part II.—Soils.

1. *Origin of Soils.*—Effect of frost, oxygen, and carbonic acid in the decomposition of rocks.

2. *Physical Properties of Soils.*—Absorption of moisture by the different ingredients of soils. Classification of soils. Influence of subsoil. Operations for improving soils.

3. *Chemical Analysis of Soils.*—Determination of percentages of nitrogen, nitric acid, ammonia, carbon in organic compounds, phosphoric acid, potash.

4. *Chemical Constitution.*—Nitrogen and carbon in the organic matter of soils. Abundance of insoluble nitrogenous organic matter in soils. Oxidation of organic matter. Formation of nitrates in soils. Nitrification due to the activity of ferments. Circumstances controlling nitrification. Phosphoric acid. Potash. Lime. Silica. Oxide of iron.

5. *Absorbent properties of Soils.*—Absorption of ammonia, potash, soda, carbonates, sulphates. Non-retention of nitrates. Composition of soil-water. Composition of drainage waters—from bare soils, and from cropped soils, manured and unmanured. Residues of manures.

6. *Sterility.*—Arising from bad physical constitution of the soil, or from the presence of injurious matters—sulphate of iron, salt. Arising from bad cultivation and neglect of manuring.

Part III.—Manures and Manuring.

1. *Liming and Marling.*—Effect of lime upon the physical condition of soils, and upon the nitrogenous and other ingredients of manures.

2. *Plastering.*—The use of gypsum, or sulphate of lime, and its effects upon manurial ingredients in the soil.

3. *Bare Fallowing.*—Facilitates the working of the land, permits the destruction of weeds, and affects the richness of the soil.

4. *Irrigation.*—Quantities of water employed. Methods of distribution.

5. *Vegetable Manures.*—Residues of crops. Plants cultivated as manures. Marine plants employed as manures. Oil cakes. Factory and other refuse.

6. *Manures of Animal Origin.*—Guano and its adulterations. Phosphatic guanos. Fish manure. Dried blood. Wool and leather waste.

7. *Sewage and allied Manures.*—Poudrette. Sewage farms.

8. *Nitrogenous Manures.*—Sulphate of ammonia. Nitrate of soda: its loss in drainage waters. Comparative values of ammoniacal nitrogen and nitric nitrogen.

9. *Farmyard Manure.*—Ingredients which give to farmyard manure its value. Fermentation, and origin of the ferments. Composition of interstitial air of farmyard manure. Losses of nitrogen, in the free state and as ammonia. Changes which dung undergoes in the soil. Duration of effect. Composts.

10. *Phosphates.*—Mineral phosphates—apatites, phosphorites, phosphatic nodules, coprolites, basic cinder. Animal phosphates: bones, phosphatic guanos. Superphosphates. Respective classes of soils upon which phosphatic manures are likely and not likely to prove useful.

11. *Potash Manures, &c.*—Sources of potash manures. Use of potash for tubers, root crops, cereals, grass lands, tobacco, and vines. Salt. Sulphate of iron.

12. *Chemical Manures.*—Exclusive use of chemical fertilisers. Simultaneous use of chemical fertilisers and farmyard manure, and of chemical fertilisers and green manures. Quantities of chemical fertilisers necessary to supplement applications of farmyard or green manures.

13. *Analyses of Manures.*—Methods of determining the percentages of potash, nitrogen, and phosphoric acid in the various manures that severally contain them.

14. *Prices and Values of Manures.*—Methods for calculating the values of manures, and of their ingredients. Fractions of the value of a manure which should be assigned to successive crops grown after its application.

From the foregoing condensed summary it will be apparent that M. Dehérain's volume, though dealing with what is strictly speaking only one branch of agricultural chemistry, is nevertheless full and exhaustive so far as it goes. The work is, moreover, well printed and excellently arranged.

In the third part of the treatise appear some instructive remarks upon the disadvantages attending the exclusive use of chemical fertilisers, particularly the unfavourable effect these manures have upon the physical properties of the soil. An analogy is sought in the profound changes which gelatinous substances may be caused to undergo in the laboratory. As a case in point, gelatinous silica is soluble in acids, but when dried is quite insoluble. Clay, the particles of which remain in suspension in pure water, becomes coagulated under the influence of salts, and separates from the liquid through which previously it had been diffused.

In certain classes of soils chemical manures cause clay to behave in a similar way; such soils then become hard, and can be worked only with difficulty. This, however, is not invariably the case, for the soils at Rothamsted appear not to be susceptible of this influence, whereas, in the Isère district of France, M. Michel Perret has been compelled to abandon the exclusive use of chemical fertilisers. Again, M. Maercker, in discussing the comparative values of farmyard manure and chemical fertilisers, cites a case at Benkendorf in which the exclusive application of chemical manures had brought the soil into such a condition that it became exceedingly difficult to work. It was, however, found possible to bring this soil back into a workable state by the application of lime at the rate of three tons per acre, a costly operation, and one that diminished materially the

benefits it was hoped to derive from the use of the chemical manures.

Great as is the risk attending the exclusive use of chemical fertilisers, there is no gainsaying their value when employed in conjunction with farmyard manure, for they are admirably suited to make good the deficiency of phosphorus and of potash in the latter. Moreover, although the ammoniacal or organic nitrogen of farmyard manure is capable eventually of being assimilated, this can occur only after nitrification has taken place. But for this process certain conditions of moisture and temperature are indispensable. In a cold dry spring, therefore, the nitrogen of farmyard manure becomes available only very slowly, and that at a time when the young plant has need of an abundance of food. Consequently, at such a period, the application of a moderate dressing of nitrate of soda is capable of exercising a decisive influence.

Of numerous examples of the value of farmyard manure and chemical fertilisers used simultaneously, we quote the following, obtained by M. Dehérain at Blaringhem. The yields are given in kilogrammes per hectare (1 kilogramme = 2·2 lb. ; 1 hectare = 2 acres 1 rood 35 poles), and as it is the *comparative* values which are of interest, there would be no advantage in converting the figures into their English equivalents :—

	Grain, kilog.	Straw, kilog.
Farmyard manure alone	3,640	5,900
Ditto	3,750	6,000
Farmyard manure, sulphate of ammonia, and superphosphate of lime	4,900	8,800
Ditto	4,800	8,600
Farmyard manure, nitrate of soda, and superphosphate of lime	4,750	10,100
Ditto	4,750	8,400
Farmyard manure, sulphate of ammonia, superphosphate, and chloride of potassium .	4,650	8,400
Ditto	4,850	9,500

It is seen that the yield was increased one-third by associating with the farmyard manure chemical fertilisers containing nitrogen and phosphorus. The soil at Blaringhem is very clayey, and has no deficiency of potash ; consequently the addition of chloride of potassium produced no marked effect, and was unnecessary.

The great advantage, it is pointed out, of chemical fertilisers is that, as they afford separately the essential elements, nitrogen, phosphorus, and potash, it is possible to apply by their means only the element or elements in which the soil is deficient. Most cultivators, as well as the French farmers' syndicates, purchase the chemical manures in their primary forms—nitrate of soda or sulphate of ammonia as yielding nitrogen, superphosphates or basic cinder as sources of phosphorus, and chloride or sulphate of potash as affording potassium—and are resorting less and less to the use of

"complete" manures, which are capable of profitable application only upon such soils as happen to lack all the elements of fertility.

A noticeable feature of the work, and one that adds much to its value, is the wealth of illustration derived from the experimental stations, not only of France, but of England, Germany, and elsewhere. The field experiments at Rothamsted and Woburn are many times referred to, and M. Dehérain possesses in a high degree the happy faculty of selecting from the mass of material at his disposal the practical results which most appropriately bear upon each of the many problems which he seeks to solve.

THE EXTERNAL FORM OF THE HORSE.[1]

THE appearance of an English translation of the well-known work of Goubaux and Barrier is an event of much interest to horse-breeders and horse-owners, to the majority of whom the volume must have remained in its original form a sealed book. Thanks, however, to Dr. Harger's careful translation, the volume is now accessible to English-speaking populations in all parts of the world, and thus appeals to a far wider, and to a certainly not less appreciative, audience than it could possibly command in its French dress.

The primary object which MM. Goubaux and Barrier had in view was, as they stated in the preface to the first edition, to select from the science which treats of the rational improvement of domestic animals—the science of Zoötechnics—so much as bears upon "the consideration of the external form and characteristics of the horse in their connection with his mechanical aptitudes and his commercial value." The translator, whilst lamenting the deficiency in English literature of any volume which studies the horse exclusively from the exterior, and discusses his external form and characters with relation to his mechanical aptitudes and his commercial value, adds that in order to remedy this defect he selected "the French veterinary text-book *par excellence*." In making this choice he admits that he was influenced no less by the reputation and standing of its authors than by the originality, exactness, and fulness with which they treat the subject.

The term *exterior*, as applied to the horse, appears to have been used by veterinarians only since the latter part of the last century, dating from the period when Bourgelat published his book upon the *external form of the horse*, in 1768, six years after the inauguration

[1] *The Exterior of the Horse.* By ARMAND GOUBAUX, Honorary Director of the Veterinary School of Alfort, and GUSTAVE BARRIER, Professor of Anatomy and the Exterior at the Veterinary School of Alfort, France. Second edition. Pages xxviii + 916, with 346 figures and 34 plates, by G. Nicolet, Librarian at the Veterinary School of Alfort. Translated and edited by SIMON J. J. HARGER, V.M.D., Professor of Anatomy and Zoötechnics in the Veterinary Department of the University of Pennsylvania. J. B. Lippincott Company: Philadelphia, and 10 Henrietta Street, Covent Garden, London. 1892.

of veterinary schools. The object of studying the exterior of the horse is defined to be to enable us to determine by a rapid examination of the form of a horse his relative commercial value in the service in which he is to be employed. It is argued that a rational course of study will facilitate the acquirement of this faculty, notwithstanding the fact that high perfection in this respect may be acquired by certain persons who are quite ignorant of the sciences which are applied to the exterior.

"The officers of our remounts, of our studs, even simple horse dealers [we should hardly venture to describe them as 'simple,' in England], astonish us sometimes by the rapidity with which they see in a horse the weak point, the defect, and the blemish; they have, moreover, that veritable tact of knowing how to adapt themselves in their purchases to the exigencies, modes, and fancies of the times. However, the time which it has taken them to obtain the result must be considered. Theoretical ideas have precisely the effect of shortening this time; they are, for beginners, aids which experience will allow them to dispense with, but without which they could not rise above this empirical knowledge, appanage of the ignorant and of the coxcomb, who accepts under the same title the true and the false, and who is incapable of distinguishing otherwise than by the routine with which he proceeds."

In conformity with the views thus enunciated the authors commence with a brief but necessary section dealing with animal mechanics, wherein are discussed such elementary ideas as those concerning the centre of gravity, the lever and muscular mechanism, and the inclined plane. The second section is occupied with a study of the regions, as a preliminary to which the whole of the external surface of the horse is, as it were, mapped out into parts, each with its appropriate name. The several regions comprised in the head, the body, and the limbs are then considered one by one with reference to certain pre-arranged definitions of beauties, defects, blemishes, vices, and faults. A difficulty arises from the circumstance that the words *blemish*, *vice*, and *fault* are often used synonymously when applied to the horse. Nevertheless, by the term *blemish* is designated a cause of depreciation, superficial and apparent. *Vice* and *fault* seem rather to convey the idea of something concealed.

"However it may be, we add that most usually the name blemish is given to cicatrices, tumours resulting from accident, operations which the animal has undergone, or different diseases which have left apparent lesions. Let us give some examples. A horse one of whose articulations has been cauterised is blemished. A horse which presents enlargements around the hock is blemished. The same thing follows when blisters are applied to the walls of the thorax, and the hairs are not replaced at the place of application. A horse which after having been bled has contracted an inflammation of the jugular vein, with a consecutive obliteration of the latter, is a blemished horse."

Vice may in some cases result from the bad character of the animal, or from his imperfect education. A horse which bites, strikes, rears, and pulls backward, without being induced to do so,

is a vicious horse. "To the word *vice* is usually given the sense of a serious moral imperfection; to the word *fault*, that of a slight moral imperfection; finally, to the word *defect*, that of a physical deficiency more or less serious." The malformations that are associated with various curious but expressive terms are discussed in this section—Roman nose, camel nose, lop ear, swine ear, pig's eye, gross eye, hollow eye, wall eye, lolling tongue, arched head, hare-faced head, hurdy-gurdy head, sway back, corded flank, tucked-up flank, hooped knee, low-jointed pastern, flat foot, pumiced foot, cross foot, club foot, dry foot, &c. The following rules as to the nostril are concise and instructive:—

1. The nostril should be large and clear.
2. The mucous membrane, rosy at rest, more or less red after exercise.
3. The liquid which it discharges clear and transparent.
4. The air which is exhaled inodorous.
5. Inspiration and expiration should be noiseless.

Defining the *croup* as the region on the median line of the superior surface of the body, bounded in front by the loins, behind by the tail, and on each side by the thigh and the superior part of the buttock, the Arabian maxim is quoted, "As to the horse whose croup is as long as his back and loins united, you can safely choose him even with your eyes closed; such a horse is a blessing." The idea which it is sought to convey is "that the long croup should always be preferred, to the exclusion of all others."

The third section of the volume deals with proportions, a term which "signifies agreement and correlation when it is applied to the different parts of one whole." Proportions may be good or bad, perfect or defective; in reference thereto the animal is spoken of as well formed, correct in his lines, of handsome form, beautiful symmetry, beautiful lines; or he may be "in two pieces," inharmoniously constructed, wanting in form and in symmetry. The accuracy with which this branch of the subject is studied is enhanced by the many numerical details which are given, albeit the measurements are in the metric system, both here and in the other parts of the work. The following paragraph appears in this section:—

"The race-horse (the English thoroughbred) has been, until the present time, the most successful variety which human industry has developed with reference to speed as the main quality. The principal characters of his conformation are useful to us in distinguishing our rapid motors from among all others. They should, in fact, have high chests and members; short and well-supported body and loins; neck, shoulder, croup, thigh, buttock, leg, and fore-arm long; without too much bulk to the body; strong, dry, and clean members; wide and thick articulations; they must be closed in their superior angles, open in their inferior; have a deep chest; a small abdomen; skin, hairs, and mane thin; an intelligent, expressive physiognomy; must be graceful, active, excitable (blood), energetic, impetuous, and of an inexhaustible endurance."

The horse in relation to locomotion is the subject of the fourth section. It is divided into two parts, the one dealing with attitudes

and movements "upon place," that is, not involving progression, and the other with the mode of progression, or gaits of the horse. The illustrations, many of them from instantaneous photographs, are here particularly helpful. The authors discuss rearing, kicking, the amble, pacing, the trot (broken trot, flying trot, rocking, skipping, the canter, running walk), the walk (backing), the gallop, leaping (bounding and bucking). The defects in the gaits which are noticed include dragging the toe, excessive knee-action, pegged shoulders, string-halt, rotating hocks, forging, rocking, strain of the loins, paddling, interfering, and lameness. With regard to lameness, we cannot forbear quoting the following :—

> "Recognition of the Lame Member.—To arrive at this result necessitates an examination of the subject at rest, in the walk, and in the trot. In each instance he must be led by the hand with a strap, or be mounted.
>
> "*a. At rest*, we notice if the position of the members is regular or irregular. Sometimes the diseased member is carried in advance of its vertical axis, which is expressed by saying that the horse *points*; sometimes it is placed under the centre of gravity, or, again, is abducted from its vertical axis. Sometimes it rests upon the ground with the toe, or is held altogether in the air. At other times it undergoes isochronous movements, being incessantly rested and elevated, especially if the pain is great; the litter is then pawed back and trampled into a heap; the corresponding shoe, in certain cases, presents a polish which is not seen in that of the other members.
>
> "*b.* It is necessary now to observe the horse *in action*. In this process he is led at a walk by the hand, with the precaution of not giving him too much liberty, and, at the same time, without furnishing any support to the movements of the head. The veterinarian stations himself in such a manner as to see the movements successively from in front, from behind, and in profile from the two sides. If the lameness is slight the walk is insufficient to show it, and the animal must be trotted.
>
> "The irregularity of locomotion, in the latter gait, is rendered more evident on account of the stronger concussion against the soil. It is for this reason that a lameness which was not visible in the walk becomes apparent in the trot.
>
> "Having seen the animal trot in a straight line, it is sometimes well to turn him around a circle, with a view of surcharging the particular lateral biped. Finally, he is rapidly turned from side to side, in such a manner as to see whether the elevation of the diseased member is more rapid and its contact with the ground more painful than that of the healthy member.
>
> "*c.* The *choice of the surface* over which the horse is moved must be considered. A horse which appears *sound* may, at times, limp if he suddenly passes from a dirt road to a hard pavement. Likewise, it is not rare to see the lameness augment in intensity if the test takes place upon a ploughed field or some other soft surface. The horse, in this case, is obliged to use greater muscular efforts, which means more pain, in elevating his members and disengaging them from the soil into which the feet bury themselves."

The fifth section relates to the age of the horse as determined by the teeth and other indications. The sixth section is occupied with considerations relative to the description and identification of the horse. With reference to the colour of the coat—black, sorrel, Isabel, bay, mouse colour, and fox colour are described as *primitive* coats, because they are such as the foal has at birth; grey, white, flea-bitten, and roan as *derived* coats, being due to the subsequent

introduction of white into a primitive coat; piebald and Isabel as *conjugate* coats, when the same animal possesses two primitive or distinct derived coats. The humorous legend concerning the origin of the name "Isabella" is related on the authority both of Bouillet and of Littré. The story, however, had better be told in our own language.[1]

In the seventh section, "the aptitudes or the services," the purposes to which horses are applied are considered. Under the head of race-horses are discussed—the running-horse, the steeple-chaser, and trotters (in harness or under the saddle). Next come "horses of luxury,"—large and small coach horses, and saddle horses (the hackney, the cob, the hunter, the double pony, and the pony). Cavalry horses are made to include staff-horses and troop-horses. Horses of industry and commerce comprise all draught horses—slow heavy draught horses (dray-horses), fast heavy draught horses (brewers' and milkmen's horses, stage-coach, omnibus, and tramway horses), and light draught horses.

Vicious horses get a section (the eighth and last) to themselves. The whims and vicious habits discussed comprise lolling, doubling, or protruding the tongue, striking the lower lip against the upper, rubbing the lower extremity of the head against the manger, shaking the head up and down or jerking the reins, grasping the branches of the bit with the lower lip, tearing blankets with the teeth, resting one hind foot upon the other, lying down cow-fashion, stripping the halter, rolling as soon as harnessed or when entering the stable after work, trotting in the stable, pawing in the stable, weaving like a bear, eating earth, cribbing or sucking wind. Vices, properly so-called, are such as render the animal dangerous or almost useless. Examples are afforded in the *balky* horse, which disobeys the command of his driver, or refuses to go in the desired direction; the *biter*, which attacks, or defends himself with his teeth; the *kicker*, which similarly uses his hind feet; the *rearing* horse, which raises the fore part of the body to strike or dismount his rider; the *shyer*, which is easily frightened by accidental things or circumstances for which he cannot account. Sometimes vicious horses are qualified as *wicked*, and at other times as *stubborn*. The general causes of vice are briefly noticed.

The concluding chapter "Choice of the Horse," is filled with hints of the most valuable character, the application of which in business would probably more than repay the cost of the book in a single transaction. It affords an admirable commentary upon the saying quoted earlier in the volume that, in the purchase of horses, "he who does not open his eyes opens his purse wide."

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[1] "Fashions have frequently originated from circumstances as silly as the following one. Isabella, daughter of Philip II. and wife of the Archduke Albert (Governor of the Netherlands), vowed not to change her linen till Ostend was taken. This siege, unluckily for her comfort, lasted three years (1601–1604), and the supposed colour of the Archduchess's linen gave rise to a fashionable colour, hence called *l'Isabeau*, or the Isabella—a kind of whitish-yellow-dingy."—D'Israeli, *Curiosities of Literature*.—Ed.

The publishers have produced the English edition in a most attractive style—paper, letter-press, and illustrations are all good and pleasing. It is true that the translation is the work of an American authority, but English readers will none the less give it a cordial welcome on that account. Dr. Harger has, indeed, creditably acquitted himself of what must have been a very difficult task, and all who have occasion to consult the volume will readily agree with the translator that it contains valuable information for the practitioner, the student, the horseman, and the breeder.

GUIDES TO THE AGE OF LIVESTOCK.[1]

As might be expected from the relative importance of the subject, considerably more than half of this work is devoted to the dentition of the horse. In the Society's pamphlet, "Dentition as indicative of the Age of Farm Animals," Professor Brown has dealt in a popular way with the subjects which are more fully treated in the volume under notice, which comes from the pen of an American veterinarian. After an instructive chapter on the form, structure, and general characters of teeth, the author proceeds to divide the life of the horse into five periods. Of these, the first extends from the eruption of the incisors of the first (or milk) dentition to the age of ten months. The second period, ending at two years, is marked by the levelling, progressive use, and falling out of the incisors of the first dentition. The third period extends till the age of the animal is five years off, and is characterised by the eruption of the permanent or adult teeth. The fourth period, during which the levelling of the permanent incisors is in progress, ends when the horse is eight years old. After this time, which we are told is commonly known as "past mark of mouth," the chief indications of age are afforded in the wearing away of the crowns of the teeth, the fifth period comprising the remainder of life after the eighth year has been completed.

One of the most interesting sections of the book is that dealing with irregularities in the dental system of horses. These are classed as (1) increase or diminution in the normal number of teeth, (2) unusual shape of incisors, (3) union of two incisors, (4) fissure of the dental cup, (5) abnormal depth or size of the dental cup, (6) excessive length or size of one of the jaws, (7) excess or fault of use, (8) marks produced by cribbing, (9) fraudulent alterations,—removal of the milk-teeth, bishoping, filing the corners.

Horses have been known with double rows of incisor teeth,—the author's phrase, "incisive teeth," is not commendable. Supernumerary molars have only been found in the upper jaw. Diminution in the number of incisors is less frequent than augmentation,

[1] *Age of the Domestic Animals, being a complete Treatise on the Dentition of the Horse, Ox, Sheep, Hog, and Dog, and on the various other Means of determining the Age of these Animals.* By RUSH SHIPPEN HUIDEKOPER, M.D. Pages viii + 217, with 194 illustrations. Philadelphia and London: F. A. Davis. 1891.

and must not be confounded with cases of tardy eruption. The suppression of the tushes in the mare is practically a normal condition. Excessive length of the incisors of the upper jaw constitutes the defect commonly known as "parrot mouth," and is seldom seen except in very old horses. As regards the molar teeth we read :—

"Irregularity and deformity of the molars are the causes of much constitutional trouble ; the interference with the mechanical action of the jaws and the soreness produced in them and in the cheeks and tongue render trituration of the food and mixture with saliva incomplete ; the unprepared food is not digested and assimilated properly, causing a defective nutrition ; the animal falls away in flesh, becomes hide-bound, and may have attacks of indigestion. The non-assimilation of the food causes indigestion and atony of the digestive tract and predisposes to intestinal calculi. The molars of all stable-fed animals should be looked to once or twice a year, including those of race-colts which are grain-fed from weaning. The inspection of molars should constitute a part of examination for soundness."

Two kinds of "cribbing" are distinguished : first that of the wind-sucker, who practises the habit nose in air, and consequently produces no abnormal wearing of the teeth ; and second, the cribber, who requires some foreign body between the teeth and wears them away at the place of prehension. On this subject the author remarks :—

"In examining an animal, even when the age is readily recognised, care should be taken to open the jaws completely, so as to inspect all surfaces of the teeth. While cribbing marks, when on the anterior face of the teeth, are apparent on superficial examination, those on the posterior face are often hidden by the foam and saliva, unless care is taken to wipe the latter away. A slight bevel worn on the anterior surface is evident, with the teeth closed, from the separation of the enamel and the presence of a yellow line, made by the exposed dentine, while a considerable bevel might be overlooked when its surface is a continuation of the yellow dentine of the table and is looked at from the front."

On the subject of tampering with horses' mouths for fraudulent purposes it is mentioned that within recent years, especially in America, there has arisen a fraternity of "Equine Dentists," a guild endowed with great enthusiasm, "who not only relieve the animals suffering from irregular and sharp molars, but, with artistic skill, remodel the whole mouth, and produce changes which sometimes greatly complicate the characters of the teeth as indications of the age of the horse."

On the question of the dentition of the pig, the author has some observations which are likely to prove of interest to breeders and exhibitors.

Some of the statements are open to exception, as, for example (page 171), "All breeds of cattle are provided with horns, except that known as the Angus or Polled Angus." Perhaps an American writer may be forgiven for his want of familiarity with the Galloway and the Red Polled breeds.

The volume will serve a useful purpose should it prove the means of inducing breeders to acquire a fuller knowledge of the teeth of live-stock, to which end the engravings which are profusely scattered through the work cannot fail to largely contribute.

ANIMALS INJURIOUS AND USEFUL IN AGRICULTURE.[1]

THE animals useful or injurious to the cultivator of the soil or the breeder of livestock form the subject of this large volume.

FIG. 1.—Harvest Mice (*Mus messorius*, or *Mus minutus*), with their nest.

The author adopts a zoological arrangement, and discusses successively (1) the vertebrate animals, (2) the arthropod or jointed

[1] *Tierische Schädlinge und Nützlinge für Ackerbau, Viehzucht, Wald- und Gartenbau; Lebensformen, Vorkommen, Einflusz und die Maszregeln zu Vertilgung und Schutz.* Praktisches Handbuch von Dr. J. RITZEMA BOS, Dozent an der Landwirtschaftlichen Lehranstalt in Wageningen. Pages xvi + 876, with 477 illustrations. Berlin: Paul Parey, 1891.

animals, (3) the molluscous or soft-bodied animals—slugs and snails, and (4) the worms, in so far as each group furnishes members

Fig. 2.—Beans injured by Bean-seed Beetle, *Bruchus rufimanus*, Schönh.

which can be regarded as actively injurious or beneficial to the agriculturist.

Of the first group, the Vertebrata, the Mammals (or animals that suckle their young) naturally claim the leading place. Of these, five or six orders are noticed. The Carnivora, or flesh-eaters, are represented by the wild cat, wolf, fox, martens, weasels, otters, and badger. Of the Insectivora, useful as feeding upon insects and their larvæ, the shrews, the mole, and the hedgehog claim attention, and these are followed by the bats. The Rodentia, or gnawing animals, many of which are specially destructive, include the hares and rabbits, beavers, rats and mice (Fig. 1), voles, dormice, and squirrels. The Ruminantia are represented by the deer, and the Ungulata by the wild boar.

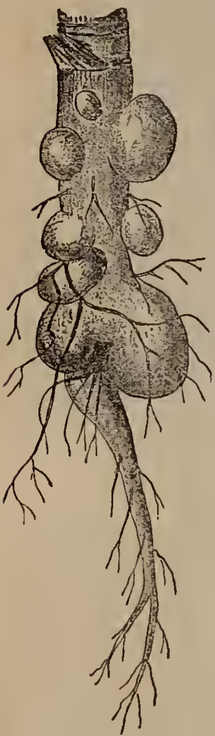

Fig. 3.—Root of Rape Plant, with galls made by the Turnip-gall Weevil, *Ceutorhynchus sulcicollis*, Gyll.

The only other class of vertebrates noticed is that of the Birds; the remaining three classes—Reptiles, Amphibians, and Fishes—finding no place in the volume, although the frogs and toads might well have been included amongst the useful animals. Upwards of one hundred pages are devoted to the birds, those members of this extensive class which are either notoriously destructive, or specially beneficial, being discussed at length. For the purpose in view, the birds are arranged in the following groups:—(1) Hawks, falcons and owls; (2) cuckoos, woodpeckers and kingfishers; (3) passerine birds, including swallows, tree-creepers, starlings, rooks, magpies, jays, wrens, titmice, larks, crossbills, yellowhammers, finches, wagtails, thrushes and blackbirds, whinchats, warblers, &c.; (4) the doves and pigeons; (5) the scraping or scratching birds, including grouse, partridges, and pheasants; (6) the long-legged or wading birds, such as plovers, coots, corn-crakes, snipe, and herons; and (7) the swimming birds.

It is to the Arthropods, including the Insects, that the body of

the work is devoted, this section alone occupying 460 pages. The author first deals with the large order of the beetles, which include the weevils (Figs. 2 and 3). Then follow the Orthoptera (earwigs, crickets, and grass-hoppers), the Neuroptera, the Hymenoptera (saw-flies, gall-flies, &c.), the butterflies and moths (Fig. 4), the Aphides or

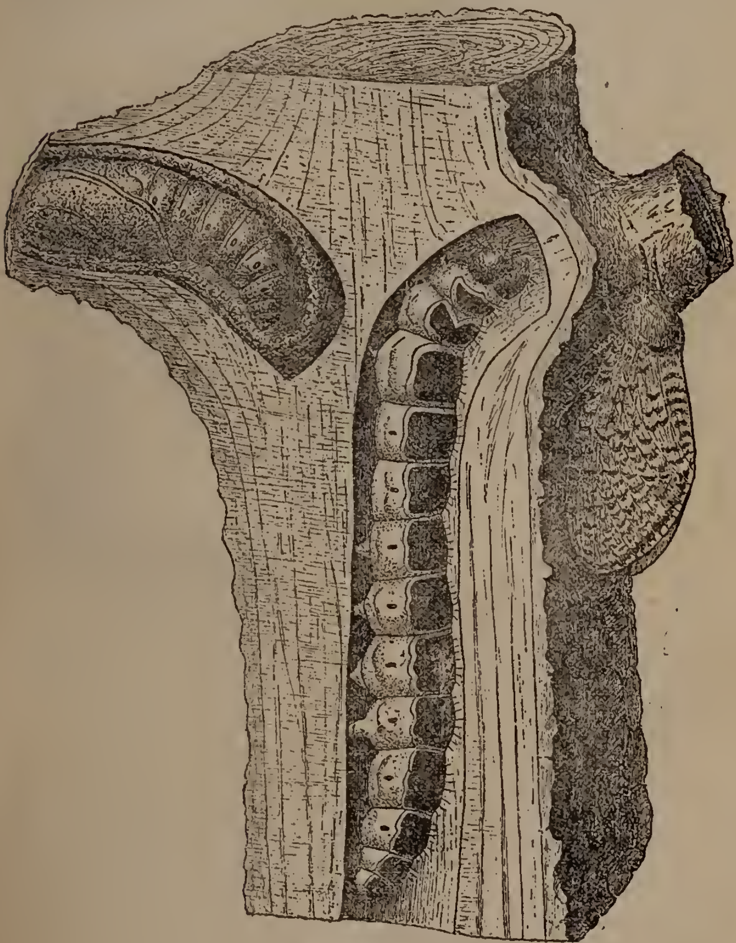

FIG. 4.—The Goat Moth or Willow-borer, *Cossus ligniperda.*

plant-lice (Fig. 5), and the Diptera or two-winged flies (gnats, midges, gadflies, &c.). In this portion of the book, which is amply illustrated, the author does for his readers what Miss E. A. Ormerod has so well performed in this country, in indicating the methods of prevention of, or the remedies for, the attacks of injurious insects.

Frequent references to the writings of Miss Ormerod occur in the text.

More than 200 pages are occupied by the worms, which are broadly classed as thread-worms, tape-worms, and flukes. In the first-named group are included the eelworms, and in the fifty pages which he sets apart for the description of these lowly organisms, Dr. Ritzema Bos presents a fund of valuable information upon a subject concerning which he is one of the first of living authorities.

The usefulness of the book as a work of reference is enhanced by a full list of the animals and plants reared or cultivated by man, there being added opposite the name of each animal or plant the names of the pests which annoy or prey upon it, together with the number of

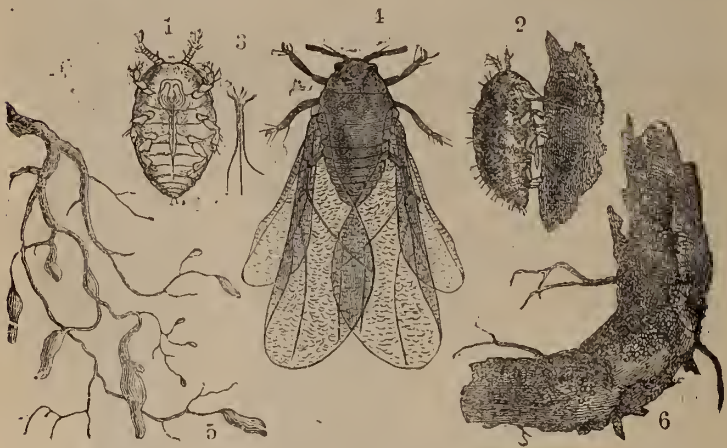

FIG. 5.—The Vine Louse, *Phylloxera vastatrix* (allied to the Aphides of English gardens).
1, Under surface of root louse.
2, Side view of sucking louse.
3, Beak.
4, Winged Phylloxera.
(1 to 4 greatly enlarged.)
5, Vine-root with galls made by Phylloxera.
6, Old vine-root with lice of the previous season.

the page upon which it is described. In the case of the horse, for example, are enumerated various gnats and other flies, the horse-louse and scab-mite, and several intestinal worms. The enemies of the potato crop are seen to include rabbits, mice, voles, cockchafer grubs, wireworms, surface caterpillars, the death's-head moth, Julus worms, snails and slugs, eelworms. Of the animal pests of the farm-house and farm buildings there are enumerated, amongst others, rats, mice, sparrows, crickets, cockroaches, granary weevils, flour moths, blow-flies, cheese-mites, slugs, &c. An alphabetical index of about 1,600 names is an additional help to the inquiring reader.

As a guide to dwellers in the country, the author—omitting for this purpose any reference to insects or animals lower in the scale—enumerates on page 20 the following mammals and birds as always useful, and therefore deserving of protection, not of persecution :—

Shrews, bats, owls, cuckoos, swallows, swifts, nightjars, tree-creepers, woodpeckers, wrens, robins, whitethroats, water-wagtails, and titmice. Useful as a rule, but sometimes doing harm are: Moles, thrushes, blackbirds, starlings, chaffinches.

We extract a few notes on cuckoos, wireworms, and eelworms as examples of the class of instruction the work affords.

THE CUCKOO.—This, one of the most familiar of our summer visitors, is particularly useful in devouring hairy caterpillars, such as those of the bufftip moth, which feed on the leaves of lime, oak, elm, and other trees. Looper caterpillars, as well as the full-legged larvæ of other moths, are equally consumed by the cuckoo. As the summer advances this bird destroys immense quantities of the grubs which prey upon the leaves of cruciferous crops, notably the larvæ of the turnip sawfly.

THE WIREWORM. — Potatoes may be successfully employed as baits or traps to free land from wireworms. On some of the famous flower farms of Holland it pays to resort to this method of keeping in check the destructive larvæ of the click-beetle. Herr Jongkindt Corinck, of Dedemsvaart, Overyssel, has the potatoes cut into two, or, if the tubers are very large, into four pieces, and strewn upon the infested garden ground. On the following morning they are collected,

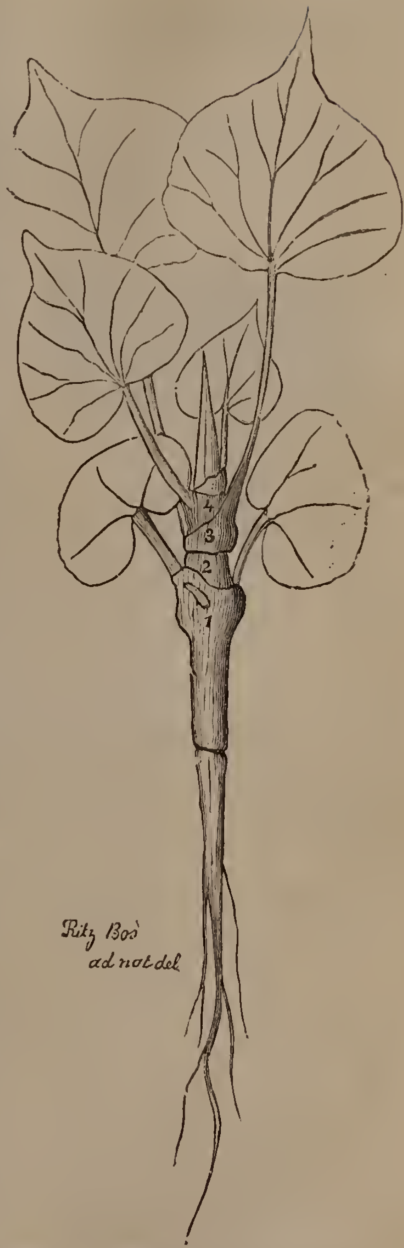

FIG. 6.—Buckwheat suffering from attack of Eelworms.

and each piece is commonly found to contain from four to eight wireworms, and often Julus worms ("false wireworms," or snake millipedes). In the spring of 1883, a field growing Spiræa japonica was thus treated, with the result that about 80,000 wire-worms and Julus worms per acre were captured and destroyed.

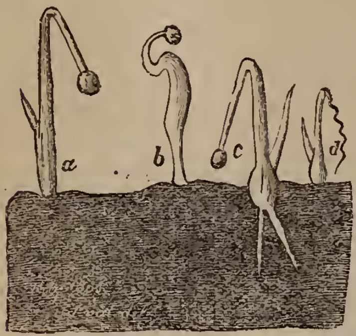

FIG. 7.—Onion seedlings (*b*, *c*, *d*) attacked by Eelworms; *a*, a healthy plant.

THE EELWORM.—The stem-eelworm, *Tylenchus devastatrix*, is familiar to English farmers on account of its presence in clover plants smitten with clover sickness, and in oat plants suffering from tulip-root. Dr. Ritzema Bos has discovered it in a number of other plants, which, for the convenience of the reader, we have arranged in the following tabular form.:—

Common Name.	Systematic Name.	Natural.
Upright buttercup	Ranunculus acris, L.	Ranunculaceæ
Shepherd's purse	Capsella Bursa-pastoris, DC.	Cruciferæ
Spurrey	Spergula arvensis, L.	Caryophyllaceæ
Carnation	Dianthus caryophyllus, L.	"
Dove's-foot cranesbill	Geranium molle, L.	Geraniaceæ
Lucerne	Medicago sativa, L.	Leguminosæ
Teasel	Dipsacus sylvestris, L.	Dipsaceæ
Corn blue-bottle	Centaurea Cyanus, L.	Compositæ
Daisy	Bellis perennis, L.	"
Sharp-fringed sow-thistle	Sonchus oleraceus, L.	"
Potato	Solanum tuberosum	Solanaceæ
Plantain, or ribwort	Plantago lanceolata, L.	Plantagineæ
Buckwheat (Fig. 6)	Polygonum Fagopyrum	Polygonaceæ
Climbing bistort	Polygonum Convolvulus, L.	"
Onion (Fig. 7)	Allium Cepa	Liliaceæ
Crow garlic	Allium vineale, L.	"
Chives	Allium Schœnoprasum, L.	"
Sweet vernal grass	Anthoxanthum odoratum, L.	Gramineæ
Yorkshire fog	Holcus lanatus, L.	"
Annual meadow grass	Poa annua, L.	"
Wheat	Triticum vulgare, L.	"

Besides the foregoing, there are enumerated several species of Narcissus, Scilla, and Hyacinthus, and also a moss (*Hypnum cupressiforme*), making in all thirty-six species, belonging to sixteen natural orders. It would appear, therefore, that the stem-eelworm is likely to be widely diffused in gardens, arable fields, and grass lands, whilst it is highly probable that further investigation will add to the list of plants liable to be infested by this minute pest. In the case of some species the eelworm seems only occasionally to wander into the plant, and not to disfigure it, whilst in other cases it becomes parasitic in great numbers and leads to plant-sickness.

We are indebted to the author and the publisher for permission to reproduce from the work the illustrations which are here presented.

W. FREAM.

PRODUCTION AND CONSUMPTION OF MILK.

In no branch of agricultural statistics has there been more uncertainty than in that which relates to the production of milk. In view of the yearly increasing importance of the dairying industry, it had long appeared to the writer that an attempt—if only in the direction of the roughest "pioneer" work—was desirable, to ascertain what data were obtainable on the subject, and how far they might justify generalisation. It was with this object that the paper was prepared which was read before the Royal Statistical Society on April 26, 1892, under the title of "An Inquiry into the Statistics of the Production and Consumption of Milk and Milk Products in Great Britain." While the subject of that paper is one in which many readers of this Journal may feel an interest, it is possible that the form in which it was presented, and the lengthy tables with which it was necessarily encumbered, would only be considered readable by a few. A condensed summary, therefore, of the calculations made and the conclusions arrived at may perhaps not be unacceptable in these pages, while those who wish to go more closely into the details may be referred to the Journal of the Royal Statistical Society, in which the paper will be published at length.

While many farmers, it may be hoped, will recognise the importance of the investigation, none will deny the difficulties which surround and complicate it. Sir John Lawes wrote :—

"The subject is full of complication, and even to ascertain what is the average yield of a dairy of cows is most difficult. You may obtain, no doubt, how much milk a man sells or produces ; but one man brings up calves, another (and this is much more important) purchases cows just after or just before calving ; some bring in their heifers, which always yield less milk ; some only use cows. I have no doubt that you will obtain some useful information."

The problem was thus stated :—

(*a*) Given an ascertained number of cows in Great Britain at a certain date, yielding or capable of yielding milk, what is the total quantity of milk which they will produce in the year, and, further, what proportions of such total quantity are made into butter and cheese respectively ?

(*b*) What is the average annual consumption, per head of population, of (i) milk, (ii) butter, (iii) cheese in Great Britain ; and how much of each is home produce, the quantities imported and the population being known ?

The attempt to fix the average yields of cows obviously involved, in the first place, an appeal to practical men. A large number of circulars were accordingly sent out to farmers in all parts of the country, and a considerable proportion of them were duly filled up and returned. The replies which were received vividly displayed the variety of conditions and circumstances which have to be taken into account. The calf is, first of all,

the innocent cause of untold complications. Milk is now so essentially an article of human food that we have almost lost sight of the calf's original claim. As a matter of fact, however, there is still an appreciable number of what we may call old-fashioned cows, who do no more than rear their calves. Thus, a Herefordshire correspondent replied to the inquiry as to how much milk per cow is, in his district, used for rearing calves: "All, as a rule;" and this answer I believe fairly applies to the greater part of that county. Again, a Lincolnshire correspondent wrote: "In Lincolnshire a large number of calves are bought from dairy counties and reared for beef. A cow rears on an average two or three calves per annum." On the other hand, the practice which possibly most widely prevails, and yearly increases, is for the cow practically not to rear a calf at all, the whole of her milk, with only an infinitesimal deduction, going to market.

The yield of milk from individual cows varies enormously. A table was given, showing, for all the animals in one Shorthorn herd (that of Mr. I. N. Edwards, of St. Albans), the number of days in milk and the weight of milk yielded after each calf. The length of time during which a cow continuously gave milk ranged from 112 to 471 days, and the quantity of milk given by one cow during one lacteal period, from 1,458 lb. to 11,162 lb. The age of the animals affects the yield. Mr. J. F. Hall, of Sharcombe, Wells, wrote that he found, from records in his Jersey herd, that the average yield of 38 heifers, with their first and second calves (under four years old), for 42 weeks—which was the average period of lactation—was 503 gallons, while with 13 older animals the average yield for 41 weeks—the average period of lactation, in their case—was 584 gallons. Mr. George Gibbons, of Tunley, Bath, stated that two-year-old heifers would give only two-thirds of the average for older cows.

Various estimates of the average yield per cow made by different authorities were referred to, the four most recent for the United Kingdom (after deducting for calves) being, Mr. Morton (1885), 294 gallons; Professor Sheldon (1889), 403 gallons; Mr. James Howard (1888), 360 gallons; Mr. Turnbull (1890), 393 gallons.

A number of data referring to foreign countries having been noted, reference was made to a few maximum yields.

Instances of an individual yield per cow of 1,000 gallons and upwards are by no means uncommon. Exceptional cases, however, are of little value, save as curiosities. It is of more interest to refer to a few instances, which were tabulated, of what may be taken as fairly typical records of dairy herds in this country extending over several years. These records are, of course, in the nature of maxima, as they refer to herds specially kept for milk, while the mere fact of records being carefully kept is an indication that the management is above the average. For what it is worth, however, it may be mentioned that the average annual yield per cow, several different breeds being represented, came out as 666 gallons.

A table compiled from returns specially collected from farmers all over the country, and containing seventy-four different estimates for the districts specified, gave as the mean for Great Britain 528·75 gallons as the gross annual yield per cow, 93·07 gallons as used for calves, and 435·07 gallons as the net available yield.

A further table was given of the actual annual yield of milk of fifty herds of dairy cattle in various districts, with, in each case, the number of cows as returned for the purpose of the Agricultural Returns. The mean available yield of milk per cow on these records was 471 gallons, the figures having a wide range. Generally speaking, however, it may be assumed that such records are only available in the case of herds kept specially for milk production, and consequently we should expect to find the yield somewhat high. On the other hand, however, there is no doubt that the average yield in each case is pulled down to a certain extent by the fact that many of the cows or heifers enumerated may have contributed very little to the year's supply.

After a reference to Scotland and Ireland, the general standard to be adopted was considered, and attention was directed to the fact that the calf had been eliminated. Former estimates have, as a rule, taken the gross yield and then deducted a certain proportion for the calf. No doubt it comes to the same thing in the end; but it may tend to clearness to endeavour to bear in mind that milk taken by the calf cannot be considered as coming into a calculation of milk production at all. To reckon calves as "consumers" seems to me rather confusing. Now, according to the table of estimated yields, the average worked out at 435 gallons per cow. I am disposed to think that this errs on the side of excess. It contained several instances of low net yields, where the calf swallows a goodly share of the milk; as, for instance, in Lincoln, 40 and 52 per cent. respectively; in Shropshire, 50 per cent.; and in Northampton, 80 per cent. But, for the simple and natural reason that it is easier to obtain returns about milk from those who are chiefly engaged in its production, I do not think the returns from the non-dairying districts bear a sufficiently large proportion to the total. On the whole, therefore, I ventured to state, after a careful consideration of such facts as I had been able to obtain from all sources, that if we deduct 10 per cent. from the figure given by the table, the result will very fairly approximate to the truth. This gives us, therefore, roundly, 400 gallons as the standard net average available yield of milk per cow for the United Kingdom.

The total number of cows or heifers in milk or in calf in the United Kingdom in 1890, that being the year taken for the purpose of the paper, was 3,938,416; but I do not think it can be assumed that all of these are effective producers of milk, either for calf-rearing or consumption. There is on any given date a certain proportion of the cows in every herd dry, either for calving or fattening. The former are, as a matter of course, included in the returns, and it is possible that many of the latter, though they ought, strictly speaking, to be excluded, are reckoned among

the cows and heifers returned. As regards the proportion of cows in a herd actually in milk at a given date, I gathered, from statements made by a few of my correspondents, that it might be reckoned at something like 80 per cent. It seemed to me that it would be misleading to take the whole number of cows and heifers in the Agricultural Returns into the calculation, without allowing for a proportion which are always non-productive. I therefore ventured to deduct, under this head, 10 per cent. from the number of cows and heifers as returned.

The figures, therefore, stand thus:—

Number of cows and heifers "in milk and in calf," 4th June, 1890	3,938,416
Deduct 10 per cent. as non-productive . . .	393,841
	3,544,575
Total production (in imperial gallons) of milk in the year 1890, at an estimated average net yield of 400 gallons per cow	1 417,830,000

A table was given showing the number of cows in the country in each of the past twenty-six years, together with the population and the proportion of cows to population. Comparing quinquennial periods, there were in Great Britain in 1866–70, 82·1 cows per 1,000 of population, and in 1886–90 there were only 77·9. The absolute number of cows had increased, but not sufficiently to keep pace with the growth of population. The latest return (for 1891) however, is more encouraging, showing as it does the largest number of cows on record. In Ireland, of course, the circumstances differ essentially. There the period 1886–90 showed a higher proportion (290·8) of cows to population than any of the four preceding quinquennial periods; but this was due, not to an increase in the number of cattle, but to the decrease of population.

It is interesting to note that the proportion of cows and heifers in milk or in calf to the total number of cattle in the United Kingdom has shown, on the whole, a tendency to decrease during the past twenty years. In England, Wales, and Scotland respectively the absolute number of animals engaged in milk production was larger in 1891 than in any year on record, but, relatively to the total herds, less than it was at the commencement of the period. In Ireland milch cattle were not only absolutely less, but relatively they showed a greater decline than in any other division of the United Kingdom. This was shown in detail by a table.

The second branch of the subject—namely, consumption—was first dealt with by a series of figures relating to the London milk supply. Returns obtained from the general managers of the railways having termini in the metropolis showed that the total quantity of milk brought by rail to London was, in 1890, 40,431,819 gallons, or about 110,000 gallons per day. The deputy clerk of the London County

Council (Mr. Alfred Spencer) also kindly supplied some valuable information. The number of licensed cowshed premises still existing in the county of London is 620, the number of cows kept therein being about 8,500. Twenty-five years ago there were 10,000, and shortly before that there were 24,000. The present London milk supply was thus summarised :—

	Gallons per Day	Gallons per Annum	Per Cent.
By rail	110,712	40,431,000	83·1
From cowsheds	20,000	7,300,000	15.0
By road and miscellaneous	2,527	923,000	1·9
Total . . .	133,239	48,654,000	100·0

Taking the present population (1891) of London as 4,211,056, this gives an annual consumption per head of only 11·55 gallons (0·25 pint per day).

Some figures were given—supplied from the books of milk sellers—showing the average daily delivery of milk per family in nine different localities, four of them being districts of the metropolis, three districts of Manchester, and two small country towns. In each case the returns were worked to show the consumption per head, which, on the basis of five persons per family, ranged from thirty-four to three gallons per annum.

If we take each of the nine cases as typical, and give each an equal value, we get an average daily consumption per family of 2·17 pints, and per head of 0·43 pint, and an average annual consumption per head of 19·75 gallons.

Another set of figures was given, as throwing a little further light on the subject. These were returns from eighteen public institutions in or near London—none of them being hospitals or places where there is a medical dietary—showing the average daily consumption of milk, cheese, and butter per head. To these were added figures taken from the books of a large West-end boarding-house. The mean consumption per head per diem was, milk 0·66 pint, cheese 0·54 oz., butter 0·90 oz. The figures were—especially as regards milk—no doubt exceptional, and not to be relied on for a general calculation.

Various other estimates and returns were referred to as bearing on the question of consumption, and finally I ventured to put the probable consumption per head of butter and cheese in the United Kingdom at the present time as follows :—

Butter—15lb. per annum, or 0·66 oz. per day.
Cheese—12 " 0 53 "

This includes a foreign supply of 8·8 lb. of butter and 6·1 lb. of cheese per head per annum.

As regards the consumption per head of milk, three calculations from very different data were given in the paper. The average (30·25 gallons) given in the table referring to public institutions

was dismissed as being altogether exceptional in regard to milk. There remained the two quantities given by the figures referring to the London milk supply (11·55 gallons), and by those obtained from milk sellers in various localities (19·75 gallons). The calculation referring to London milk was perhaps the closest and most reliable which I was able to give, resting as it does almost entirely on ascertained figures. Unfortunately, for reasons previously stated, we cannot rely on it as typical of the country at large. Nor, in the face of the London figures, should we be justified in adopting universally the figure given by the milk sellers' returns. Taking everything into consideration, I ventured to suggest that an average of 15 gallons per head represented the annual milk consumption of the people of the United Kingdom. This amounts to a daily consumption of one-third (0·33) of a pint per day per head, as compared with Mr. Morton's latest estimate (1885) of one-fourth of a pint per head.

Taking, therefore, the annual production (on the basis of 1890), as previously stated, at 1,417 million gallons, we may reckon it to be consumed as follows:—Milk, 570 million gallons; butter, 617 million gallons (representing 105,000 tons of butter); cheese, 224 million gallons (representing 100,000 tons of cheese); miscellaneous (condensed milk, &c.), 6 million gallons.[1]

The total consumption per head of dairy produce, with the amount of milk represented thereby, is shown in the following statement:—

	Consumption per Head			Total Quantity of Milk represented (in thousands of gallons—000's omitted)		
	Home Produce	Foreign Produce (*Net* Imports)	Total	Home Produce	Foreign Produce[2]	Total
	Galls.	Galls.	Galls.	Galls.	Galls.	Galls.
Milk . .	15	—	15	570,000,	—	570,000,
	lb.	lb.	lb.			
Butter	6·2	8·8	15	617,000,	884,000,	1,501,000,
Cheese	5·9	6·1	12	224,000,	232,000,	456,000,
Miscellaneous, condensed milk, &c.	—	—	—	6,000,	13,000,	19,000,
	—	—	—	1,417,000,	1,129,000,	2,546,000,

In calculating the ratio of milk to cheese and butter respectively, I assumed throughout the paper that 1 lb. of cheese represents one gallon, and 1 lb. of butter represents 21 pints. The latter was, in

[1] Reducing these figures to percentages, it would appear that of the milk produced in the United Kingdom, 40·2 per cent. is consumed as milk, 43·5 per cent. as butter, 15·8 per cent. as cheese, and 0·4 per cent. as condensed milk, &c.—Ed.

[2] The quantity of milk represented by the cheese and butter imported is based on the same ratio as that of the home produce.

the discussion which followed the reading of the paper, challenged by Mr. George Barham, who considered that the average would be more like 28 or even 30 pints to 1 lb. of butter. I stated in the paper that I had fortified myself with a considerable collection of figures on this point, and I ventured to point out that it had lately been authoritatively stated that 16 pints of Jersey milk, of average quality, will produce one pound of butter, when set and churned in the ordinary manner. It will not be denied that the Jersey cow is now a very influential factor in the butter production of the country. It might also be fair to point out that as long ago as 1878, in this Journal, Mr. Morton adopted 21 pints as the average quantity of milk to a pound of butter. It is probable that the estimate then was too high, but since that time the introduction of cream separators, the increase of "butter breeds," such as the Jersey, and the general improvement in dairy matters, must have tended to raise the ratio, so that if it was even approximately true then, it can scarcely be too high now.

Another interesting question raised in the discussion was whether the average yield of milk per cow has increased in comparison with, say, half a century ago. Mr. Barham stated that, in his opinion, the produce of the average cow was less now than it was forty years ago, though more than it was fifteen years ago; and Sir Rawson Rawson took up the point as a reproach to farmers. It is not, perhaps, a matter which can be decided with certainty. No doubt, fifteen or twenty years ago, the tendency to despise dairying properties had, especially as regards Shorthorns, decreased the milking qualities of a considerable number of the stock of the country; but it must be remembered that the rage for pedigree, and pedigree only, did not affect all districts alike, and that in some parts of the country, as in Scotland, for instance, attention was even then being directed to milk production, especially in connection with improved cheese-making. Apart from this, as there is no evidence that forty or fifty years ago, or at any previous time, any special attention had been given to milk production, it is surely fair to assume that the very energetic and widespread efforts of the past decade have more than recovered the ground lost by the Shorthorn craze of the fifties, sixties, and early seventies, and that therefore the average yield per cow is higher now than it was, not only fifteen, but also forty, years ago.

R. Henry Rew.

FIXATION OF FREE NITROGEN BY THE LOWER GREEN PLANTS.

A notable contribution to our knowledge of the Nitrogen Question is contained in a memoir, by MM. Th. Schlœsing fils and Em. Laurent, entitled "Recherches sur la Fixation de l'Azote libre par les Plantes," which occupies upwards of fifty pages in the *Annales de l'Institut Pasteur* (Tome VI., no. 2, 1892).

In the prosecution of experiments made to determine to what extent plants are capable of availing themselves of the free nitrogen of the air, two methods of procedure may be employed. These are known respectively as the direct method and the indirect.

In order to ascertain beyond all doubt whether free nitrogen gas is taken up by plants, it appeared to the investigators that the preferable method was to accurately ascertain the quantity of gaseous nitrogen which came in contact with the plants in the course of their development, and to record the volume of this nitrogen before and after growth. If a certain quantity of the nitrogen disappeared in the course of growth, it might be reasonably affirmed that some of the gas had been fixed. Then would arise the question as to whether such nitrogen had been fixed by the plants or by the soil which carried them. To settle this point, the same soils are maintained under exactly similar conditions, save that they are kept free from plants. If it were found that, whilst in the case of the cropped soils there was gain of nitrogen, in that of the bare soils there was no such gain, it would be fair to attribute the fixation to the action of the plants and not of the soil. This is the *direct* method, and it is so called because it supplies a direct answer to the question, Is free nitrogen gas taken up by plants?

The other method, the one which has been usually followed, involves an exact ascertainment of the quantity of nitrogen (1) before growth, in both soils and seeds, (2) after growth, in both soils and plants. If there has been fixation of nitrogen the second result will be higher than the first. This is the *indirect* method.

If both methods are adopted, and are rigidly carried out, they ought to agree in their results. If there has been fixation, the disappearance of nitrogen gas recorded by the direct method should agree with the gain of nitrogen indicated by the indirect process. Where no fixation has occurred the direct method should furnish equal quantities of nitrogen gas in the air before and after growth, whilst the indirect method should show no gain of nitrogen by plant or soil. The one method controls the other, and all experiments in which the two methods do not furnish accordant results should be rejected

As a matter of fact, MM. Schlœsing fils and Laurent have employed the two methods simultaneously, as they felt that the results so obtained would be more likely to inspire confidence than would have been the case had they restricted themselves to one method only. It is not necessary, in this brief abstract of their memoir, to enter upon a description of the elaborate apparatus which they used, or to discuss the rigid precautions which were adopted in order to eliminate all sources of error. These belong to the technical details of manipulation in experimental chemistry and physiology.

In their experiments of 1890 the investigators sought to verify the accepted fact of the fixation of free nitrogen by certain leguminous plants. For this purpose peas were planted in a soil, practically free from nitrogen and sterilised by heat, but afterwards

sown with nodule-producing microbes. In the course of their growth the peas took up the free nitrogen of the air, more than half the nitrogen which the plants finally contained being derived from this source and the rest from the seed. Peas grown simultaneously in identical soil, which, however, was not sown with microbes, fixed no free nitrogen.

In 1891 the experiments were extended to plants other than leguminous species. Plants belonging to several different natural orders, as well as peas representing the papilionaceous division of the Leguminosæ, were grown under similar conditions throughout. These diverse plants were :—

Jerusalem artichoke,—nat. ord. Compositæ.
Oats,—nat. ord. Gramineæ.
Tobacco,—nat. ord. Solanaceæ.
Mustard,—nat. ord. Cruciferæ.
Cress ,, ,,
Giant spurrey,—nat. ord. Caryophyllaceæ.

Two series of experiments were made in 1891. In the first series the surfaces of all the soils became covered, to a greater or less extent, with inferior green plants, amongst which were recognised certain Mosses (Bryum, Leptobryum) and certain Algæ [1] (Conferva, Oscillaria, Nitzschia).

In all these cases absorption of nitrogen took place, save in two instances in which the development of these humble forms of plant-life was very feeble. In one case in which none of the higher plants were present, the soil became clothed with a notable quantity of the lower green plants, and advantage was taken of this circumstance to determine what proportion of the absorbed nitrogen had been taken up by the plants, and what proportion by the soil. It was found that all the nitrogen that had been gained was accounted for by the plants, the underlying soil not showing any gain.

In the second series of the experiments of 1891 measures were adopted to prevent the appearance of the inferior green plants. This was effected by covering the soil, after the seeds had been sown, with a thin layer of calcined quartz-sand, upon which nothing

[1] The Algæ comprise the lowest form of plant-life. A familiar example is afforded by the green material which accumulates in rain-water butts, on damp palings and tree-trunks, and in puddles which are drying up; it consists of the unicellular plant called Protococcus, which forms an instructive object under the microscope. The green threads seen in fresh-water ponds afford another common example of an alga; this plant is called Spirogyra, and it consists merely of a string of cells placed end to end. The Algæ differ from the Fungi in this important respect, that although from a structural point of view both are very lowly organised, their cells forming no structures corresponding with the fibrous tissues of the higher plants, yet the Algæ produce chlorophyll and can therefore make their own starch, whereas the Fungi, containing none of the green pigment chlorophyll, are incapable of a function of so much physiological importance. The seaweeds are Algæ, and in red seaweeds the chlorophyll is merely masked by the presence of some other pigment.—W. F.

could grow (Mosses and Algæ possess no roots). In this series of experiments there was no fixation of free nitrogen, neither by the soil nor by the plants other than peas.

The investigators arrive at the following conclusions :—

1. The Leguminosæ (division Papilionaceæ), as represented by peas, are able to draw largely upon the free nitrogen of the air for purposes of growth.

2. *Some of the inferior green plants possess the same property.*

3. In the conditions under which the experiments were conducted, bare soils—that is, soils devoid of any apparent vegetation —failed to fix free nitrogen in any measurable quantity. Oats, mustard, cress, spurrey likewise failed to fix the free nitrogen under conditions identical with those in which peas fixed it abundantly.

Of the preceding conclusions it is the second one which will especially force itself upon the attention of those who have followed, during recent years, the course of discovery in this important field of investigation. The authors admit that Frank had already (1888 and 1889) claimed for some of the lower green plants the property of fixing free nitrogen. They argue, however, that his proofs were indirect and insufficient. They further note that MM. Arm. Gautier and R. Drouin had encountered these humble green plants in the course of experiments upon the fixation of nitrogen, but had regarded them as instrumental in promoting the absorption only of combined nitrogen, and had rejected the idea of a fixation of free nitrogen by their means.

It deserves to be recalled that under the term "inferior green plants" the authors designate a complex assemblage of lowly organised plants, amongst which were recognised certain Algæ and certain Mosses, some of the latter attaining an inch in height. It was to this assemblage of plants that the fixation of free nitrogen was attributed.

If we accept the results of the elaborate research of MM. Schlœsing fils and Laurent, it becomes necessary to extend the list of nitrogen-fixing plants so as to include, not only papilionaceous plants, but some at least of the Mosses and Algæ. It is a fact known to all who are familiar with meadows and pastures that these are liable at certain seasons of the year to be invaded by mosses and other cryptogams, some of which, we learn, are capable of fixing the free nitrogen of the atmosphere. When, with the advance of spring, these humble plants die, they must enrich the soil with the nitrogen that they have acquired.

When a soil commences to form upon what has hitherto been bare rock it is the same lowly plants which first take possession of the surface. Is it not possible that the stores of nitrogen which our cultivated soils contain were begun long ago by mosses and other rootless plants, which represent the highest forms of vegetation the incipient soil is capable of supporting?

Whether Mosses and Algæ possess the power of direct assimila-

tion of free nitrogen, or whether they effect a symbiosis similar to that which exists between papilionaceous plants and the nodule-forming microbes, is a problem which still awaits investigation, and this will doubtless be forthcoming in due course. Meanwhile, the results of the experiments which are here briefly set forth are of the greatest interest, and serve to add another link to the chain of facts which are so profoundly modifying our views concerning the nutrition of plants.

Since the foregoing was in type, I have been favoured with a letter from Dr. J. H. Gilbert, F.R.S., in which he states that when at Halle last year, Hellriegel told him that they had been experimenting on this subject; and more recently he has sent Dr. Gilbert some account of their results. In 1889 they filled a series of glass jars with sterilised sand; some were left without infection, some were infected with the watery extract of soil; some were excluded from light, and others exposed to light. In the dark there was, neither without nor with microbe-seeding, more than a mere trace of either growth or gain of nitrogen; but in the light there was, with microbe-seeding, considerable growth and considerable gain of nitrogen. Other somewhat similar experiments were also made, with similar results. The growth was chiefly of Algæ.

Professor Hellriegel concludes that certain Algæ, and certain other low forms, do fix free nitrogen; and in answer to Dr. Gilbert's inquiries, he gives it as his opinion that the action may be of some importance in the origination of soils, but probably not in soils under actual cultivation.

W. Fream.

RECENT AGRICULTURAL INVENTIONS

The subjects of Applications for Patents from March 14 *to June* 10, 1892.

N.B.—Where the Invention is a communication from abroad, the name of the Inventor is shown in italics, between parentheses, after the name of the applicant.

Agricultural Machinery and Implements, &c.

No. of Application. (Year 1892)	Name of Applicant.	Title of Invention.
5133	Perkins, J. E. S.	Hay-making machines.
5454	Panton, J. R.	Automatic self-feed for threshing machines.
5494	Warburton, J. S.	Machine for digging potatoes.
5549	Boult (*Mercer, Canada*)	Sheaf binders.
5691	Stayner & Roberts	Spades.

No. of Application.	Name of Applicant.	Title of Invention.
5778	Stratton, W. G. . .	Combined seed-sower and horse-rake.
6297	Harrison, R. F. . .	Reaping and mowing machines.
6383	Bisset, T. S. . .	Reaping machines.
6483	Jack, T. B. . . .	Device for binding sheaves.
6626	Barker, R. W. (*Kealy, U.S.A.*) . . .	Ploughs.
7010	Boulet, A. . . .	Plough.
7028	Hardingham (*Morgan*)	Harrows.
7426	Skinner, J. & Algoe .	Cutting apparatus for harvesters.
7456	Ford, J. . . .	Self-binding reaping machines.
7621	Drakard, J. & C. .	Reaping machines.
7634	Rul, M. . . .	Threshing machine.
8053	Clear, F. T. . .	Reaping machine.
8054	,, ,, . . .	Cultivating implement.
8187	Wagener, J. L. . .	Ploughs.
8215	Nicholson & Mather .	Hay-making machines.
8339	Chenhalls, A. . .	Seed drills.
8873	Gilbert & Begg . .	Attaching a reversible share-plate to the foot of a plough, &c.
9374	Telford, S. . . .	Turn-over rake.
9378	Lidgerwood, W. V. V.	Drying cereals.
9430	David, W. . . .	Earth pulveriser and rake.
9673	Butterfield, D. . .	Turnip cutting and slicing machine.
9710	Livens, F. H. . .	Threshing machine.
9729	Wood, W. A. . .	Hay and straw presses.
10066	Perkins, J. E. S. . .	Hay-making machines.
10182	Bamford, S. B. . .	Wrought iron frames for chaff cutters.
10255	Swallow, M. C. . .	Portable rick covering for cut crops.
10261	Taylor & Hulme .	Rustless metallic alloy for parts of ploughs.
10343	Hall, B. . . .	Steam digging machines.
10606	Hornsby & Innocent .	Conveying and elevating cut crops in sheaf-binding reapers.
10607	,, ,, ,, .	Turn-wrest ploughs.
10922	Boult (*Fox*) . .	Ploughs.

Stable Utensils and Fittings—Horse-shoes, &c.

4959	Fagan, E. D. . .	Safety habit strap for ladies' saddles.
5250	Cooper, W. . . .	Safety saddle bar.
5284	Buckingham, J. . .	Reins.
5405	Gatzmanga, E. . .	Horse-shoes.
5888	Hartmann, C. . .	,, ,,
5901	Choël, A. C. . .	Protective covering for horses' hoofs.
6004	Bonsor & Parr . .	Nose-bags.
6055	Haas, S. H. . . .	Shaft tugs.

No. of Application.	Name of Applicant.	Title of Invention.
6071	KONDAKOFF, W.	Horse-shoes.
6233	LARGE, P. T. S.	Harnessing a pair of horses to 2-wheeled vehicles.
6338	DE ROSSI-GALLICO	Collapsible manger and head guard.
6461	ALLAN, G. S.	Fixing studs as roughs in horse-shoes.
6552	MORGAN, J.	Safety stirrup.
6634	PEASGOOD and TRACY	Horse-shoes.
6973	SCHROEDER, C.	Harness pads.
7006	TAITE and CARLTON (*Westlake*)	Saddles.
7030	DAILEY and others	Horse-blankets.
7038	SCHMIT, J.	Detaching horses from vehicles.
7130	GLOSTER, T. & BANKS, B.	Safety riding-stirrup.
7277	GLOSSOP, J.	Dumb jockey.
7289	O'BRIEN, J.	Horse-shoe.
7309	HUBAND, T. A.	Horse-shoeing rasp.
7545	PRATER, J. J.	Equalising the draught of horses.
7551	HAGUE & BOLLES	Preventing horses knocking together their hind-legs.
7762	BOULT, A. (*Mayer, U.S.A.*)	Stirrups.
7824	WESTON & WILTON	Template or curve gauge for measuring horses for collars, &c.
7867	ROSSI-GALLICO	Portable and collapsible manger and head guard for horses, &c.
8069	COPELAND, J.	Single double-acting rein.
8209	JENDGES, J.	Arresting runaway horses.
8237	HIRST, T.	Halters.
8338	FELSTEAD, A.	Horse-shoes for use on slippery ground.
8398	DENMAN, J. W.	Horse-shoe pads to prevent slipping.
8402	ADAM, T.	Horse-shoes.
8431	BONCHERÉ, E. T.	Horse snow-soles.
8444	HORNE, G. W.	Side saddles.
8534	ECKFORD & DUNCAN	Harness.
8807	PARKER, A.	Steel tubular 'coupling' bar for pair-horse harness.
9243	MORGAN, E. K. B.	Roller horse-clipper.
9269	BOULT (*McCall, Victoria*)	Preventing horses running away.
9302	APPELT & KNOB	Horse-hoof protector.
9368	BEALE, W.	Horse-shoes.
9406	DOWNIE, H.	Hoof-pads.
9460	SULLIVAN, Sir E.	Horse-shoes.
9610	ECKART, J.	" "
9681	HAMPSON & STOKES	Saddle bars.
9976	BENNETT, R.	Nose-bags.
10174	DELANEY, J.	Preventing the fouling of the beds of horses.

No. of Application.	Name of Applicant.	Title of Invention.
10587	CHESHIRE, G. (*Nash, N.S.W.*) . .	. Substitute for horse's collar.
10795	NELSON & OTHERS	. Double loops for harness straps.
10826	FRENCH, C. B. .	. Stopping running away of horses.
10902	CONSTANTINE, A. B.	. Pneumatic collar.
10905	JEFFRIES, E. .	. Harness saddles.

Carts and Carriages.

5105	HORA, E. . .	. Tipping vans.
5875	GOATCHER, W. .	. Locking gear for tipping carts.
6838	BOTT & GUEST .	. Wheels for vehicles.
7729	GREEN, E. . .	. Brakes, &c.
8071	TAGGART, R. C. .	. Poop-block for carriages.
8437	HAILSTONE, C. .	. Tip carts, waggons, &c.

Dairy Utensils, &c.

5650	KASTENGREN, C. F.	. Milking apparatus.
5983	LLEWWELLIN, J. .	. Churns.
6271	BREAME, J. R. .	. Securing milk cans to buildings from outside
6817	GRAYSON, T. . .	. Railway milk churns.
7447	JONES, J. . .	. Dairy refrigerator.
7697	BRADFORD . .	. Lid for churns.
7823	MELLOR, W. W., & SHAW	Milk cans.
7936	SHIELS, A. . .	. Teat cups of milking machines.
7938	„ . .	. Vacuum controlling apparatus for milking machines.
8264	MÜLLER, G. . .	. Producing sterilized butter.
8325	SHIELS, A. . .	. Vacuum regulating apparatus for milking machines.
10719	WILSON. . .	. Butter worker.

Poultry and Game, &c., Appliances.

4938	CORNTHWAITE, R.	. Poultry drinking fountain and syphon.
5142	WALKER, F. T. .	. Incubator.
6365	SECCOMBE and WEEKS	. Packing eggs.
7462	MORANT, G. F., and anr.	Coop for hatching, &c., pheasants.
8682	CASHMORE, C. .	. Incubators.
9560	MANN, S. . .	. „
10449	BALL, E. A. . .	. „
10771	WILSON, T. . .	. Apparatus for raising poultry and game.

Miscellaneous.

No. of Application.	Name of Applicant.	Title of Invention.
6502	BIGG, J.	Drinking trough for cattle.
7244	BURGON, C. & H.	Shearing apparatus.
7357	MCJANNET, J. D.	Weighbridge cattle cages.
7731	ASHBURY and others	Sheep shears.
8453	HARVEY, G. A.	Metal mangers.
8419	TÄUBRICH, O.	Feeding troughs.
8994	SMITH, C. A.	Receptacle for feeding grain to stock.
9328	BOULT, A. J. (*Henry, Canada*)	Cattle medicine.
9431	JOHNSON, W.	Protecting fruit, &c., from frost or sun.
10180	HOWARD, J. H.	Beehives.
10266	BOULT (*Rehnström, Sweden*)	Fodder cakes.
10825	WOOD & DAVIES	Machines for weighing live-stock.

Numbers of Specifications relating to the above subjects Published since March 14, 1892.[1]

Specifications of 1891.

5206, 5306, 6910, 7012, 7056, 7196, 7587, 6742, 7863, 7990, 8466, 8712, 8750, 8931, 8996, 9065, 9099, 9275, 9455, 9547, 9674, 9814, 9842, 9886, 10,259, 10326, 10381, 10485, 10879, 10924, 11141, 11517, 11547, 11639, 12902 13746, 18387, 21415, 21796, 21852, 21945, 22266, 22851.

Specifications of 1892.

219, 288, 514, 546, 627, 920, 1766, 1843, 1930, 1976, 2805, 2806, 3536, 3625, 3644, 3925, 4000, 4015, 4249, 4314, 4384, 4924, 5405, 5983, 6055, 6081, 6973, 7028, 7030, 7344, 7551.

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[1] Copies (Price 8*d.* each post free) may be obtained at the Patent Office (Sale Branch), 38 Cursitor Street, London, E.C.

Estimated Total Produce and Yield per Acre of the Principal Crops, Cattle, Sheep, and Pigs, in the United

[From the Agricultural Returns and

Crops	England						Wales					
	Acreage, 'thousands' (000) omitted		Produce of crops, 'thousands' (000) omitted		Average yield per acre		Acreage, 'thousands' (000) omitted		Produce of crops, 'thousands' (000) omitted		Average yield per acre	
	1890	1891	1890	1891	1890	1891	1890	1891	1890	1891	1890	1891
CORN CROPS :—	Acres	Acres	Bush.	Bush.	Bush.	Bush.	Acres	Acres	Bush.	Bush.	Bush.	Bush.
Wheat	2,256	2,192	69,442	68,694	30·79	31·33	68	61	1,713	1,462	24·94	23·73
Barley or Bere	1,776	1,772	62,250	60,901	35·06	34·36	120	117	3,622	3,439	30·24	29·36
Oats	1,648	1,673	72,104	69,786	43·75	41·72	241	234	8,116	7,699	33·65	32·89
Rye	45	38	—	—	—	—	1	1	—	—	—	—
Beans	340	338	11,103	9,966	32·63	29·54	2	2	59	55	31·35	29·11
Peas	216	202	6,223	5,703	28·76	28·31	2	2	40	31	23·62	19·98
TOTAL CORN CROPS	6,281	6,215	—	—	—	—	434	417	—	—	—	—
GREEN CROPS :—			Tons	Tons	Tons	Tons			Tons	Tons	Tons	Tons
Potatoes	348	355	1,959	2,051	5·62	5·78	40	38	177	208	4·43	5·44
Turnips and Swedes	1,393	1,368	19,012	17,704	13·65	12·94	73	71	1,155	1,010	15·91	14·31
Mangel	323	345	5,903	6,598	18·29	19·10	7	8	126	130	17·22	16·55
Cabbage, Kohl-rabi, and Rape	147	146	—	—	—	—	2	2	—	—	—	—
Vetches or Tares	219	214	—	—	—	—	2	2	—	—	—	—
Other Green Crops	92	102	—	—	—	—	1	1	—	—	—	—
TOTAL GREEN CROPS	2,522	2,530	—	—	—	—	125	122	—	—	—	—
OTHER CROPS, GRASS, &c. :—												
Clover and artificial grasses and permanent pasture	9,811	10,389	—	—	—	—	1,614	1,683	—	—	—	—
Ditto for hay	5,816	5,458	Cwt. 163,670	Cwt. 140,646	—	—	674	654	Cwt. 14,733	Cwt. 12,902	—	—
Flax	2	2	—	—	—	—	—	—	—	—	—	—
Hops	54	56	284	437	Cwt. 5·26	Cwt. 7·78	—	—	—	—	—	—
Small Fruit[3]	41	53	—	—	—	—	1	1	—	—	—	—
TOTAL OTHER CROPS	15,724	15,958	—	—	—	—	2,289	2,338	—	—	—	—

Live Stock	Year 1890	Year 1891	Year 1890	Year 1891
	Actual No.	Actual No.	Actual No.	Actual No.
Horses	1,099,557	1,143,050	143,336	150,186
Cattle	4,617,641	4,870,215	705,115	759,309
Sheep	16,841,288	17,874,722	3,069,710	3,233,936
Pigs	2,355,760	2,461,185	258,175	270,082

NOTE.—The produce of the Corn Crops for Ireland, which was originally given in weight, has been converted into the bushel of Beans and Peas. [1] Including Beetroot. [2] Cabbage and rape only. [3] Gooseberries,
[4] Excluding Ireland.

and also the Acreage under other Crops and Grass, and Number of Horses,
Kingdom in the Years 1890 *and* 1891.

the Agricultural Produce Statistics.]

Scotland						Ireland						United Kingdom					
Acreage, 'thousands' (000) omitted		Produce of crops, 'thousands' (000) omitted		Average yield per acre		Acreage, 'thousands' (000) omitted		Produce of crops, 'thousands' (000) omitted		Average yield per acre		Acreage, 'thousands' (000) omitted		Produce of crops, 'thousands' (000) omitted		Average yield per acre	
1890	1891	1890	1891	1890	1891	1890	1891	1890	1891	1890	1891	1890	1891	1890	1891	1890	189
Acres	Acres	Bush.	Bush.	Bush.	Bush.	Acres	Acres	Bush.	Bush.	Bush.	Bush.	Acres	Acres	Bush.	Bush.	Bus.	Bu
62	53	2,200	1,971	35·49	36·98	93	81	2,639	2,615	28·58	32·34	2,479	2,388	75,994	74,743	30·66	31·3
216	223	8,062	7,790	37·36	34·89	182	178	6,860	7,426	37·60	41·64	2,294	2,291	80,794	79,555	35·23	34·
1,014	992	39,968	34,902	39·43	35·17	1,221	1,215	51,107	54,086	41·86	44·50	4,124	4,115	171,295	166,472	41·54	40·
8	8	—	—	—	—	14	13	—	—	—	—	69	60	—	—	—	—
16	15	536	493	33·33	32·21	4	4	162	181	43·61	43·58	362	359	11,860	10,694	32·77	29·
1	1	31	26	25·48	24·48	1	1	19	18	29·30	30·48	220	205	6,313	5,777	28·71	28·
1,317	1,292	—	—	—	—	1,515	1,492	—	—	—	—	9,548	9,418	—	—	—	—
		Tons	Tons	Tons	Tons			Tons	Tons	Tons	Tons	Acres	Acres	Tons	Tons	Tons	To
142	140	676	795	4·78	5·68	781	753	1,810	3,037	2·32	4·03	1,310	1,286	4,622	6,090	3·53	4·
482	480	7,581	6,678	15·72	13·91	295	300	4,255	4,349	14·40	14·48	2,243	2,219	32,002	29,742	14·27	13·
1	1	17	23	14·57	16·74	[1] 47	[1] 52	[1] 663	[1] 807	[1] 14·27	[1] 15·60	378	406	6,709	7,558	17·76	18·
10	9	—	—	—	—	[2] 53	[2] 50	—	—	—	—	213	207	—	—	—	—
12	12	—	—	—	—	6	6	—	—	—	—	239	234	—	—	—	—
3	3	—	—	—	—	32	30	—	—	—	—	130	138	—	—	—	—
650	645	—	—	—	—	1,214	1,191	—	—	—	—	4,513	4,490	—	—	—	—
2,330	2,445	—	—	—	—	10,211	10,291	—	—	—	—	24,026	24,870	—	—	—	—
581	521	Cwt. 19,039	Cwt. 13,023	—	—	2,093	2,058	Cwt. 91,880	Cwt. 86,857	—	—	9,187	8,712	Cwt. 289,321	Cwt. 253,429	—	—
—	—	—	—	—	—	97	75	—	—	—	—	99	76	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	54	56	284	437	Cwt. 5·26	Cw 7·
4	4	—	—	—	—	—	—	—	—	—	—	[4] 47	[4] 60	—	—	—	—
2,915	2,970	—	—	—	—	12,401	12,424	—	—	—	—	33,413	33,774	—	—	—	—

Year 1890	Year 1891	Year 1890	Year 1891	Year 1890	Year 1891
Actual No. 189,727	Actual No. 195,167	Actual No. 523,384	Actual No. 528,576	Actual No. 1,964,911	Actual No. 2,026,170
1,185,876	1,223,297	4,240,753	4,448,477	10,789,858	11,343,686
7,361,461	7,623,900	4,323,805	4,722,391	31,667,195	33,533,988
159,674	157,506	1,570,279	1,367,776	4,362,040	4,272,764

bushels, at the rate of 60 *lb.* to the bushel of Wheat; 50 *lb.* to the bushel of Barley; 39 *lb.* to the bushel of Oats; and 60 *lb.*
strawberries, and other small fruit, including what is grown between trees in orchards and also in market gardens.

HAY HARVEST FORECASTS, 1891.[1]

The results of the checking of the Hay Harvest Forecasts during the hay-making period of 1891 show that, notwithstanding the very unsettled conditions which prevailed during the summer months of last year, the general percentage of success has again reached 89, being the same degree of success which was recorded in the two preceding years 1889 and 1890. The largest general percentage (94) was reached in England, N.W., while the smallest (82) was in Scotland, N.

The telegrams were sent daily between 3.30 P.M. and 4 P.M. on each week-day for about five weeks, beginning over the Southern districts of England on June 15, and ending on July 18, and commencing and ending about a fortnight later in most other parts of the country.

In addition to the recipients named in the list, telegrams were sent to six other gentlemen at their own cost.

Several of the recipients speak very favourably of the forecasts.

Summary of Results.

Districts	Names of Stations	Percentages				Total Percentage of Success
		Complete Success	Partial Success	Partial Failure	Total Failure	
Scotland, N.	Munlochy and Golspie	40	42	17	1	82
Scotland, E.	Aberfeldy, Glamis, and Rothiemay	49	41	9	1	90
England, N.E.	Chatton and Ulceby	61	26	11	2	87
England, E.	Rothamsted and Thorpe	69	23	8	—	92
Midland Counties	Cirencester and East Retford	70	22	8	—	92
England, S.	Reading, Maidstone, Downton, and Horsham	62	28	6	4	90
Scotland, W.	Ardwell, Islay, and Dumbarton	52	35	11	2	87
England, N.W.	Leyburn and Prescot	60	34	6	—	94
England, S.W.	Tortworth, Clifton, Bridgend, and Glastonbury	66	23	9	2	89
Ireland, N.	Moynalty and Edgeworthstown	58	32	10	—	90
Ireland, S.	Ardfert, Kilkenny, and Parsonstown	56	34	8	2	90
	Mean for all districts	58	31	10	1	89

[1] Particulars supplied by the Meteorological Office.

JOURNAL

OF THE

ROYAL AGRICULTURAL SOCIETY

OF ENGLAND.

ALLOTMENTS AND SMALL HOLDINGS.

Contents.

The passing of the Allotments Acts of 1887 and of 1890, and of the Small Holdings Act of 1892, is evidence of the public interest taken in recent years in the position and future prospects of the working classes generally, and especially of the agricultural labourer. Stated in a few words, the object of the first two of these measures is to facilitate the acquirement of areas not exceeding one acre, mainly, therefore, for the provision of what may be called garden allotments as distinguished from small agricultural holdings. The object of the more recent measure is, on the other hand, to facilitate the acquirement of areas of more than one, and not exceeding fifty acres, that is, for the acquirement of small farms.

Number of Allotments in Great Britain.

For many years prior to 1887, the system of granting garden allotments to agricultural labourers, and to others of our rural populations, had been established, and it had been gradually extending from year to year. Official returns showing the number of allotments granted from the date of the passing

of the Allotments Act in 1887 up to the present time, a period of rather over five years, have not been published. But such records as are available enable us to form a fairly approximate estimate of the impetus given to the extension of the system by the discussion and by the passing of the Allotments Acts. Thus, the following Table shows, for England, Wales, Scotland, and Great Britain collectively, the number of allotments, not exceeding one acre in area, in 1873, in 1886, and in 1890; the actual increase from 1873 to 1886, and from 1886 to 1890; also the average increase per annum between 1873 and 1886, and between 1886 and 1890. Supposing the returns to relate, as we believe they do, to the middle of the year in each case, the period from 1873 to 1886 will be thirteen years, and that from 1886 to 1890, four years.

TABLE I.—*Number of Allotments, not exceeding* 1 *Acre, in* 1873, 1886, *and* 1890; *also the Total, and the average annual Increase, within each Period.*

—	England	Wales	Scotland	Great Britain
Actual Number of Allotments.				
1873	242,542	1,726	2,130	246,398
1886	348,872	4,949	3,974	357,795
1890	441,024	7,562	6,419	455,005
Total Increase in Number.				
1873–1886 (13 years) . .	106,330	3,223	1,844	111,397
1886–1890 (4 years) . .	92,152	2,613	2,445	97,210
Increase in Number per Annum.				
1873–1886 (13 years) . .	8,179	248	142	8,569
1886–1890 (4 years) . .	23,038	653	611	24,302

It may be observed that details not given in the Table show that of the total number of allotments in 1890, in England about 70·5 per cent., in Wales 91·7 per cent., in Scotland 82·4 per cent., and in Great Britain as a whole 71·0 per cent., did not exceed one-quarter of an acre. Further, the figures in the Table show, that whilst the average annual increase in the number of allotments in Great Britain was 8,569 over the thirteen years 1873–1886, it was 24,302 over the four years 1886–1890, or nearly three times as great during the latter period.

Indeed, in reference to these returns, Major Craigie, in his Report dated July 18, 1890,[1] says:

"Making every allowance for the possible imperfections of the earlier figures, it seems impossible to resist the conclusion that a large and important increase has taken place. It is noteworthy that the rate of annual increase in the last four years has been apparently three times as rapid as between 1873 and 1886."

By the Allotments Act of 1890 increased powers were given for the acquirement of allotments; but whether the process has or has not thereby been quickened, there is no published evidence to show. At any rate there is, so far as we are aware, no reason to believe that the rate of increase has been less during the last two than during the preceding four years; and if the increase during the four years 1886–1890 was 97,210, it seems quite reasonable to assume that during the five years from the passing of the Allotments Act of 1887 up to the present time, the increase has considerably exceeded 100,000. Nor is it the least satisfactory element of the result that, out of the very large increase that has undoubtedly taken place, so few (only 2,891) had to be obtained under the provisions of the Acts, and only one compulsorily, as is shown by a return to an order of the House of Commons, issued by the Local Government Board, under date of June 17, 1892 (No. 310). In fact, it would seem that, as is desirable it should be, the influence of the Acts has chiefly been to stimulate voluntary action.

The Return in question shows the number of instances in which Rural Sanitary Authorities, under the provisions of the Allotments Act, 1887, and County Councils, under the provisions of the Allotments Acts of 1887 and 1890, have acquired land for allotments, by compulsory purchase, purchase by agreement, or hire by agreement; it also shows the parish in which the land has been acquired, the acreage, and the number to whom allotments have been let under the Act. It further shows, what Sanitary Authorities have not taken land for allotments, and in each case the reason why they had not done so. It appears that fifty-six Rural Sanitary Authorities have acquired land for allotments under the Allotments Act, 1887; in twelve parishes by purchase under agreement, and in eighty-two by hire under agreement. The total area so acquired was 1,126 acres, and the total number of tenants to whom the allotments had been let was 2,733. Five hundred and eighteen Rural Sanitary Autho-

[1] Return of Allotments and Small Holdings in Great Britain, obtained for the Board of Agriculture by the Inland Revenue Department (C.—6144), 1890.

rities had not acquired land, the reasons assigned being in the majority of cases that allotments had been provided voluntarily by landowners under private arrangements, or that no applications or representations under the Act had been made to them. Four County Councils had also acquired land under the Acts of 1887 and 1890; in only one parish by compulsory purchase, in one by purchase under agreement, and in six by hire under agreement; the total area so acquired being eighty-one acres, and the number of tenants to whom allotments had been let seventy-six. In the case of three parishes, the County Councils had delegated their powers as regards the land acquired by them to the Rural Sanitary Authorities, who had let it to eighty-two tenants. The total acreage acquired under the provisions of the two Acts has been 1,207, and the total number of tenants to whom the land was let was 2,891. No return is given of the acreage or number of allotments acquired independently of the provisions of the Acts, so that the only evidence available for forming a judgment on the point is that given in Table I and in the text; and there is no reason to suppose that the estimate we have given is at all excessive.

There can at any rate be no doubt that there has been a great increase in the acquirement of allotments, directly or indirectly, under the influence of the Allotments Acts of 1887 and 1890; and it is probable that the increase will continue for some time to come. Nor can there be any doubt that such allotments are a very great boon, especially to rural populations. Indeed, the fact of the rapid increase in their number which the figures indicate, is of itself sufficient evidence of the appreciation of them by those whose position they are intended to improve. It is another matter, however, whether the sanguine anticipations of those who have so strongly urged the importance of providing by enactment facilities for the acquirement, not only of allotments but of small holdings, will be realised. As every year sees an increasing number of the rural populations flocking into our towns and cities, it is, perhaps, not unnatural that the urban populations should ask why those who have been born upon the land should not be able to earn a living upon it. It will probably be admitted, on all hands, that the extension of the garden allotments system can do little of itself to stem the exodus of the populations of our villages and their accumulation in our towns. But it seems to be assumed that if existing farmers cannot or will not employ more men, the proper remedy is to establish small farms throughout the country by the aid of public funds, to be taken up, either with a view to eventual ownership, or in some cases as tenants only,

by labourers who would thus be rendered independent of weekly wages, or by others who would thus acquire an interest in the land, and so have an inducement to remain upon it. Such a subject is obviously one of great national importance, and it certainly is desirable that it should be freely and fairly discussed on its merits, without reference to party politics.

Number and Acreage of Small Holdings in Great Britain.

It is well known that within the present century there has been a great reduction in the number both of owners and of occupiers of farms not exceeding 50 acres in area, such as it seems to be the object of the promoters of the Small Holdings Act of 1892 greatly to increase. We are not able to adduce comparative statistics for different periods, showing the decline in the number and acreage of such holdings. Such evidence as is at command seems to indicate that the greatest decline was early in the century, and that it gradually lessened towards the middle. It would appear, however, that there has been a slight tendency to increase from about the commencement of the fourth quarter of the century up to the present time. Thus, in Major Craigie's Report on the Return of Allotments and Small Holdings in Great Britain obtained for the Board of Agriculture by the Inland Revenue Department—and issued in 1890 (C.—6144)—he gives the following comparative statement of the total number of holdings in Great Britain, not exceeding 50 acres, in 1875, 1880, 1885, and 1889:

Year	Small holdings
1875	389,941
1880	391,429
1885	392,203
1889	409,422

It is admitted that, as a rule, the later returns are more correct than the earlier; and the increase shown from 1875 to 1880, and that from 1880 to 1885, are so small, that they might well be explained by greater exactitude in the returns. But the increase from 1885 to 1889 amounts to 17,219, or to more than 4 per cent., and this seems too much to attribute to error in the earlier record. If, however, we exclude the holdings of less area than 1 acre, some of which it is supposed are also included in the Returns of Allotments, the increase in the number from 1 acre to 50 acres would only be about 12,000;

more than two-thirds of which would only range from 1 to 5 acres in area.

It would of course be desirable, were it possible, accurately to compare both the number and the area of holdings of various sizes at different periods, going back much earlier than the dates referred to in the summary given above. In default of reliable data of this kind, it will nevertheless be of interest to direct attention to the returns for 1885, which are more complete than those for any other period. Thus, for that year, there are given—for England, Wales, Scotland, and Great Britain as a whole—the actual number, the proportional number per cent., the acreage or aggregate area, and the average size of holdings, from ¼ to 1 acre, from 1 to 5, from 5 to 20, from 20 to 50, from 50 to 100, from 100 to 300, from 300 to 500, from 500 to 1,000, and from 1,000 acres upwards. There are also given, the number and the acreage of the respective holdings, which are wholly permanent pasture, wholly arable, and partly pasture and partly arable. Of these voluminous records,[1] Tables II, III, and IV, which follow, are summaries; and they give the various particulars for holdings from 1 acre to 50 acres, and above 50 acres, respectively.

It will be observed that holdings from ¼ to 1 acre are not included in the results given in the Tables, and this should be borne in mind in reading the comments thereon. As indicated above, it is probable that some of the holdings from ¼ to 1 acre have also been included in the returns of allotments; and although the number of these smaller holdings is not immaterial, the area is quite insignificant. Thus, in Great Britain the number of such holdings is 23,512, corresponding to about 4¼ per cent. of the whole; but their area is only 11,195 acres, corresponding to only 0·034 per cent. of the total recorded agricultural area. It should be further borne in mind, in judging of the results, that a considerable number of the recorded holdings, and especially of the smaller ones, will consist of areas attached to residences, for ornament or convenience, rather than as a means of livelihood to the holder. Then, again, especially in Wales and in Scotland, there is a not inconsiderable amount of rough or hill grazing not included in the returns of agricultural area.

The upper division of Table II shows that in each of the three divisions of Great Britain the number of holdings from

[1] Returns of the number of allotments detached from and attached to cottages, and of agricultural holdings in Great Britain, obtained for the Agricultural Department, Privy Council Office, by the Inland Revenue Department (C.—4848), 1886.

TABLE II.—*Actual Number, and Per Cent. in the total Number; aggregate Acreage, and Per Cent. in the total Area; also average Size of Holdings, from* 1 *to* 50 *Acres, and above* 50 *Acres, respectively.*

1885.

Size of holdings	England	Wales	Scotland	Great Britain
Actual Number of Holdings.				
	No.	No.	No.	No.
From 1 to 50 acres . .	273,660	40,759	54,272	368,691
Above 50 acres . . .	120,221	18,348	25,083	163,652
Total . . .	393,881	59,107	79,355	532,343
Per cent. in total Number of Holdings.				
	Per cent.	Per cent.	Per cent.	Per cent.
From 1 to 50 acres . .	69·48	68·96	68·40	69·26
Above 50 acres . . .	30·52	31·04	31·60	30·74
Total . . .	100·00	100·00	100·00	100·00
Aggregate Acreage of Holdings.				
	Acres	Acres	Acres	Acres
From 1 to 50 acres . .	3,548,559	655,183	667,289	4,871,031
Above 50 acres . . .	21,332,992	2,162,834	4,180,200	27,676,026
Total . . .	24,881,551	2,818,017	4,847,489	32,547,057
Per cent. in total Area.				
	Per cent.	Per cent.	Per cent.	Per cent.
From 1 to 50 acres . .	14·26	23·25	13·76	14·97
Above 50 acres . . .	85·74	76·75	86·24	85·03
Total . . .	100·00	100·00	100·00	100·00
Average Size of Holdings.				
	Acres	Acres	Acres	Acres
From 1 to 50 acres . .	13	16⅛	12¼	13¼
Above 50 acres . . .	177½	117⅞	166⅝	169⅛
Average of all .	63⅛	47⅝	61⅛	61⅛

1 acre to 50 acres is more than twice as great as that of those above 50 acres; indeed, the second division shows that not far short of 70 per cent. of the total number of holdings range from 1 to 50 acres. When we come to consider the question of aggregate acreage, however, the result is very different. The

figures in the third and fourth divisions of the Table show that the aggregate area of the much greater number of the smaller holdings is very much less than that of the much fewer larger ones. In fact, the figures for Great Britain as a whole show that not quite 15 per cent. of the total returned agricultural area (excluding holdings under 1 acre) is devoted to holdings from 1 to 50 acres. Wales, with its very small total agricultural area, shows, however, more than 23 per cent. comprised in the smaller holdings; whilst Scotland with its larger, and England with its very much larger, total area, show an average of only about 14 per cent. in holdings from 1 to 50 acres. Again, the bottom division of the table shows that the size of the holdings in Great Britain from 1 to 50 acres averages only 13¼ acres, and that of those above 50 acres a little over 169 acres, whilst the average of all is about 61 acres. The details show that the average size of the smaller and of the larger holdings respectively is approximately the same in England, Scotland, and Great Britain as a whole; whilst in Wales that of the smaller is greater, and that of the larger is less, than in the other divisions of the country. Details not here given further show that more than two-fifths of the total agricultural area of Great Britain are comprised in holdings from 100 to 300 acres, and nearly three-fourths in those from 50 to 500 acres.

Table III, p. 447, shows the number, and the proportion, of the smaller and of the larger holdings respectively, which are wholly permanent pasture, wholly arable, or partly permanent pasture and partly arable.

It is seen that of the total number of holdings from 1 to 50 acres in England, nearly half (48·2 per cent.) are wholly permanent pasture, next come those that are mixed pasture and arable (35·63 per cent.), and in much smaller number those that are arable only (16·17 per cent.). In Wales, as would be expected, the proportion of those wholly permanent pasture to those wholly arable is much greater, whilst those in mixed pasture and arable number considerably more than the other two put together. In Scotland, on the other hand, the larger number of the small holdings are entirely arable (51·44 per cent.); next come those that are mixed pasture and arable (39·43 per cent.); and there is a very small number wholly permanent pasture (9·13 per cent.). Lastly, in Great Britain as a whole, of the total number of the smaller holdings, 41·28 per cent. are in permanent pasture, 20·23 per cent. arable, and 38·49 per cent. in mixed pasture and arable.

Next, comparing the number and the general agricultural conditions of the holdings above 50 acres in area, it is seen

TABLE III.—*Actual Number, and Percentage in the Total Number, of Holdings from* 1 *to* 50 *acres, and above* 50 *acres respectively, which are wholly permanent pasture, wholly arable, or mixed pasture and arable: also the Percentage of the Total Number in pasture, in arable, &c., comprised in the smaller and in the larger Holdings respectively.* 1885.

Size of holdings	Actual number of holdings				Percentage of the total number of the smaller, and of the larger holdings, in pasture, arable, &c.			Percentage of the total number in pasture, in arable, &c., respectively, in the smaller and in the larger holdings			
	Permanent pasture	Arable	Mixed pasture and arable	Total	Permanent pasture	Arable	Mixed pasture and arable	Permanent pasture	Arable	Mixed pasture and arable	Total
England.											
Acres	No.	No.	No.	No.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
1—50 . . .	131,917	44,238	97,505	273,660	48·20	16·17	35·63	92·70	93·85	47·69	69·48
Above 50 . .	10,380	2,897	106,944	120,221	8·63	2·41	88·96	7·30	6·15	52·31	30·52
Total . .	142,297	47,135	204,449	393,881	36·13	11·97	51·90	100·00	100·00	100·00	100·00
Wales.[1]											
1—50 . . .	15,316	2,439	23,004	40,759	37·58	5·98	56·44	95·43	92·00	56·94	68·95
Above 50 . .	773	212	17,403	18,348	3·99	1·16	94·85	4·57	8·00	43·06	31·05
Total . .	16,049	2,651	40,407	59,107	27·15	4·49	68·36	100·00	100·00	100·00	100·00
Scotland.[1]											
1—50 . . .	4,955	27,919	21,398	54,272	9·13	51·44	39·43	85·55	72·93	60·66	68·40
Above 50 . .	837	10,364	13,882	25,083	3·34	41·32	55·34	14·45	27·07	39·34	31·60
Total . .	5,792	38,283	35,280	79,355	7·30	48·24	44·46	100·00	100·00	100·00	100·00
Great Britain.											
1—50 . . .	152,188	74,596	141,907	368,691	41·28	20·23	38·49	92·72	84·70	50·66	69·26
Above 50 . .	11,950	13,473	138,229	163,652	7·30	8·23	84·47	7·28	15·30	49·34	30·74
Total . .	164,138	88,069	280,136	532,343	30·83	16·55	52·62	100·00	100·00	100·00	100·00

[1] Especially in Wales and in Scotland, there is a not inconsiderable amount of rough or hill pasture, not included in the returns of either permanent pasture or total agricultural area; and in Scotland rotation grasses are left down for more than one year, and their area is, of course, included as "arable."

that in England nearly 89 per cent. of the whole are mixed permanent pasture and arable; only 8·63 per cent. exclusively permanent pasture, and only 2·41 per cent. exclusively arable. In Wales those in mixed permanent pasture and arable are nearly 95 per cent. of the whole, those exclusively permanent pasture constitute scarcely 4 per cent., and those exclusively arable little more than 1 per cent. In Scotland, on the other hand, only 55·34 per cent. of the total number are mixed, 41·32 per cent. are exclusively arable, and only 3·34 per cent. exclusively permanent pasture. In Great Britain as a whole, 84·47 per cent. of the total number of the larger holdings are mixed permanent pasture and arable, 7·30 per cent. exclusively pasture, and 8·23 per cent. exclusively arable.

Lastly, comparing the agricultural conditions of the holdings from 1 to 50 acres with those above 50 acres, as shown in the last four columns of the Table (p. 447), it is seen that in each division of the country a very much larger proportion of the smaller than of the larger holdings is either exclusively pasture or exclusively arable. Indeed, there are very few of the larger holdings that are exclusively either the one or the other. On the other hand, among the holdings that are mixed permanent pasture and arable, in England rather more than half the total number (52·31 per cent.) are in the larger holdings, in Wales less than half (43·06 per cent.), and in Scotland less than 40 (39·34) per cent. are in the larger holdings; and in Great Britain collectively, about an equal number (50·66 and 49·34 per cent.) are in the smaller and in the larger holdings respectively.

The next Table (IV), p. 449, which compares, not the number but the aggregate area, of the smaller and of the larger holdings in permanent pasture, or arable land, in the different divisions of the country, is in some respects of more interest.

It has already been shown in Table II, that in England and Scotland about 14 per cent., in Wales about 23 per cent., and in Great Britain about 15 per cent., of the total agricultural area (excluding holdings under 1 acre) are devoted to holdings from 1 to 50 acres. Table IV, now under consideration, shows the aggregate area, and the proportion of the whole, under permanent pasture and arable respectively, in the smaller and in the larger holdings. In Great Britain as a whole, of the about 15 per cent. of the total area which is devoted to the smaller holdings, 61·2 per cent. is permanent pasture and 38·8 per cent. arable. Of the remaining, about 85 per cent. of the total area comprising the larger holdings, scarcely 44·8 per cent. is permanent pasture, and 55·2 per cent. is arable. In other words,

TABLE IV.—*Aggregate Area, and Percentage in the Total Area, of Holdings from* 1 *to* 50 *acres, and above* 50 *acres respectively, in permanent pasture, and in arable: also the Percentage of the Total Area in pasture, and of the total arable area, comprised in the smaller and in the larger Holdings respectively.* 1885.

Size of holdings	Aggregate area			Percentage of the total area in the smaller and in the larger holdings respectively, in pasture, and in arable		Percentage of the total pasture, and of the total arable area respectively, in the smaller and in the larger holdings		
	Permanent pasture	Arable	Total	Permanent pasture	Arable	Permanent pasture	Arable	Total
England.								
Acres	Acres	Acres	Acres	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
1—50	2,356,168	1,192,391	3,548,559	66·40	33·60	19·23	9·44	14·26
Above 50 . . .	9,893,281	11,439,711	21,332,992	46·38	53·62	80·77	90·56	85·74
Total	12,249,449	12,632,102	24,881,551	49·23	50·77	100·00	100·00	100·00
Wales.[1]								
1—50	457,351	197,832	655,183	69·81	30·19	24·02	21·65	23·25
Above 50 . . .	1,446,894	715,940	2,162,834	66·90	33·10	75·98	78·35	76·75
Total	1,904,245	913,772	2,818,017	67·57	32·43	100·00	100·00	100·00
Scotland.[1]								
1—50	167,636	499,653	667,289	25·12	74.88	13·68	13·79	13·76
Above 50 . . .	1,058,384	3,121,816	4,180,200	25·32	74·68	86·32	86·21	86·24
Total	1,226,020	3,621,469	4,847,489	25·29	74·71	100·00	100·00	100·00
Great Britain.								
1—50	2,981,155	1,889,876	4,871,031	61·20	38·80	19·38	11·01	14·97
Above 50 . . .	12,398,559	15,277,467	27,676,026	44·80	55·20	80·62	88·99	85·03
Total	15,379,714	17,167,343	32,547,057	47·25	52·75	100·00	100·00	100·00

[1] Especially in Wales and in Scotland, there is a not inconsiderable amount of rough or hill pasture, not included in the returns of either permanent pasture or total agricultural area; and in Scotland rotation grasses are left down for more than one year, and their area is, of course, included as "arable."

there is a much larger proportion of permanent pasture than or arable land in the smaller holdings, and a larger proportion of arable than of permanent pasture in the larger holdings.

In England and in Wales there is a larger proportion, but in Scotland a very much smaller proportion, of the total area of the small holdings in permanent pasture than in Great Britain as a whole. Of the total area of the larger holdings, on the other hand, in England 46·38 per cent., in Wales 66·9 per cent., and in Scotland only 25·32 per cent., are permanent pasture; and it is remarkable that in Scotland the proportion of pasture to arable is almost exactly the same in the smaller and in the larger holdings.

Again, in England, of the total area under permanent pasture 19·23 per cent. is in the smaller, and 80·77 in the larger holdings; and of the total arable area, only 9·44 per cent. is in the smaller, and 90·56 per cent. in the larger holdings. In Wales, of the total area under permanent pasture, 24·02 per cent. is in the smaller, and 75·98 in the larger holdings; and of the total arable area, 21·65 per cent. is in the smaller, and 78·35 per cent. in the larger holdings. In Scotland, 13·68 per cent. of the total permanent pasture area is in the smaller, and 86·32 per cent. in the larger holdings; and of the total arable area almost exactly the same proportions as of the total permanent pasture, namely, 13·79 per cent., is in the smaller, and 86·21 per cent. in the larger holdings. Lastly, in Great Britain as a whole, of the total pasture area, 19·38 per cent., or nearly one-fifth, is in the smaller, and 80·62 per cent., or more than four-fifths, are in the larger holdings; whilst, of the total arable area, only about 11 per cent. is in the smaller and nearly 89 per cent. in the larger holdings.

Upon the whole, then, excepting in Scotland, a very much larger proportion of the area of the smaller holdings is permanent pasture than arable. On the other hand, excepting in the small total area comprised in Wales, a larger proportion of the area of the larger holdings is arable than permanent pasture; and in Scotland this is pre-eminently the case not only in the larger but also in the smaller holdings (see footnote to Table IV, p. 449).

Such is in outline a statistical view of the present position of allotments, and of small holdings, in the country generally. It is proposed, in the next place, to illustrate the working of the allotment system, by reference to actual experience in a particular case; and then to consider, from an agricultural and economic point of view, what conditions seem essential to the success of small holdings, and whether they prevail to such an

extent in Great Britain as to justify the expectation that the establishment of large numbers of them throughout the country will bring about the beneficial results, and especially the stemming of the migration of the population from the country to the towns, which seem to be anticipated by those who advocate a considerable extension of them.

The Rothamsted Allotments.

It is now about forty years since from eight to ten acres, and a few years later about an equal area, were set apart on the Rothamsted Estate as garden allotments, for the most part of one-eighth of an acre each; some, however, being less; the whole number of tenants amounting to between 160 and 170. In the midst of the allotment ground a club-house was built for the members, where they could have their beer and smoke their pipes independently of the public-house. The management of the gardens and of the club is in the hands of a committee of twelve of the members, who are elected annually.[1] Many of these allotments are held by agricultural and other labourers, and it is the general opinion that one-eighth of an acre is quite as much as a man depending on weekly wages can properly cultivate. In fact, whilst no demand has been made for larger garden allotments, requests have occasionally been made for smaller ones, on account of the smallness of the family, or the age of the tenant.

In 1883 nearly 9 acres, and in 1884 about 20 acres, or in all nearly 29 acres, were devoted to allotments in another part of the parish. Of these, 112 are of one-eighth of an acre or less, and 25 are of larger area. There are 23 allotments ranging from a quarter of an acre to an acre and a half, and these are, for the most part, held by persons of the most varied occupations, namely: two carpenters, two publicans, a blacksmith, two carters, a dealer, a butcher, a coal-dealer, a navvy, a platelayer, a market gardener, a groom and gardener, a pensioner, a bricklayer, a shoemaker, and a general labourer. There are also five agricultural labourers, two of whom have, however, joined with others.

In 1890, a notice was put up in the club-room that about 6 acres adjoining the original garden allotments would be let in plots of one acre each, at the ordinary agricultural rent of the land; but not a single agricultural labourer became an applicant for one of these lots.

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[1] See Journal, Vol. XIII. (1877), p. 387, "The Rothamsted Allotment Club." By J. Bennet Lawes.

Lastly, in the present year, 1892, about 5 acres more have been added; and they have been divided into two allotments of 1 acre each, 11 of $\frac{1}{8}$ of an acre, 6 between $\frac{1}{8}$ and $\frac{1}{16}$, and 14 of $\frac{1}{16}$ of an acre. The two 1-acre plots are respectively occupied by a blacksmith and a carpenter; and of the remaining 31 of $\frac{1}{8}$ of an acre or less, only three by agricultural labourers, the remainder being held by persons of very various occupations. It may be said that the demand for mere garden allotments is for the present satisfied; but there still remains a desire for more 1-acre plots.

Of the total number of 334 allotments, about 300 are garden allotments of one-eighth of an acre or less, and it is among the tenants of these that almost the whole of the agricultural labourers are to be found; whilst the majority of the holders of the larger allotments are persons whose earnings and general position are much above those of the labourer, some of them owning the houses in which they live, and having horses or other live-stock.

The general result is then, that, with the soil and climate such as they are in this locality, the demand for anything more than garden allotments has not come from those engaged in agricultural pursuits. The problem of the advancement of the agricultural labourer by giving him a more direct interest in the land he cultivates is, therefore, in no way advanced towards a solution by the facts above stated. Long before the cry of "Three acres and a cow" was invented, the possibility or desirability of furnishing the labourer with the means of keeping a cow was carefully considered at Rothamsted; but the idea was eventually abandoned, as it was thought that the soil and climate were not sufficiently suitable for pasture, especially in dry summers; and that, under such circumstances, the keep of a cow would be very expensive.

Conditions Essential to the Success of Small Holdings.

It is one thing to provide the agricultural labourer with sufficient garden ground to occupy his spare time, and provide his family with vegetables, or to provide the small tradesman of more spare means and time, and who does not derive his livelihood from the land, with a somewhat larger area to enable him to add a little to his income: and quite another to establish tenants or proprietors of small holdings, who are supposed not to receive wages, but to derive the whole of their livelihood from the land. It is alleged, however, that with such

a system there would be created an incentive to the rural populations to remain on the land, instead of migrating to the towns, or emigrating to our colonies or elsewhere.

It happens that for many years past there has been an excellent school in our village, with the result that many of the sons of the labourers look with contempt at the occupation of their fathers. They easily obtain much better wages on the railways or in the towns than they can get on the land; and, as a rule, they succeed exceedingly well if they are moderately intelligent, and also industrious and steady. It seems to be assumed, however, especially by those not acquainted with practical agriculture, that if a sufficient quantity of land can be obtained at a moderate price, and small farms established on it, the flow of the rural populations into the towns will be arrested; and some, indeed, are so sanguine in the matter, that they think it is desirable that the land should be taken compulsorily, in order to secure so important a result. It is not without interest, therefore, to consider what are the probabilities that the nation, or the ratepayers, would obtain an adequate return in the shape of interest, if land were acquired at its ordinary agricultural value and devoted to such a purpose.

There is some fairly good agricultural land in this parish (Harpenden), which might, perhaps, be obtained at the rate of 30*l.* per acre. Opinions may differ as to how many acres would be required to support a man, his wife, and family; but if we assume the land to be arable, and that ordinary farm crops are to be grown upon it, it is probable that, with the very low saleable value of grain, not less than forty or fifty acres would be required to enable the holder and his family to make a living in this way. The purchase money of, say, fifty acres, at 30*l.* per acre, would be 1,500*l.* A house, stable for two horses, cowhouse, some open shedding, a yard walled in, all the necessary roads and fencing, and, by way of equipment of the farm, a pair of horses, one or two cows, a few sheep and pigs, and the necessary implements, would together not cost less than 700*l.* or 800*l.* So far, then, the outlay would probably be about 2,250*l.*

When a man is set up in a shop he begins at once to earn a living, but not so the farmer. Supposing he enters upon his farm at Michaelmas, he must have the means of living, keeping his stock, and paying any other expenses, until nearly the next Michaelmas; and for this at least 1*l.* 15*s.* per week must be allowed, making altogether 91*l.* Further, for the same reason, that there would be little or no produce to sell during the first year, anything in the shape of interest or annual instalment, which can hardly be put down at less than 20*s.* per acre, as

well as tithe rent-charge and rates, at, say, 8*s.* per acre, making together 70*l.*, would probably have to be placed to capital account, which, for the first year, would therefore stand at 2,411*l.*[1]

According to the provisions of the Small Holdings Act (1892), the money required will not be available at lower interest than $3\frac{1}{8}$ per cent. At this rate the interest on the above sum would amount to rather over 75*l.* per annum. This amount would certainly rather heavily handicap the small farmer. Nor does the transaction promise to be a very satisfactory one for the ratepayers, who will be responsible for the money in the last resort. Then, on the assumption that the tenant is to become the owner, there will be a further annual charge beyond that of mere rent, for a shorter or longer period of years, according to the amount which he is able to pay off independently in the meantime.

Such, then, are some of the difficulties which will have to be encountered in any attempt to create a class of tenants, or of owners, of small farms. The foregoing calculations have, however, reference only to the establishment of small arable, or what may be termed rotation, or grain and meat farms; and when we consider that, comparing the first five of the last twenty-five years (1867–1891), with the last five, the average price of wheat per quarter has gone down from 56*s.* to 32*s.* 7*d.*, that of barley from 38*s.* 8*d.* to 27*s.* 2*d.*, and that of oats from 25*s.* 8*d.* to 17*s.* 10*d.*, the prospect is not very promising for the small farmer, who will have to produce his grain, not only in competition with foreign countries, but with the farmers of his own country who hold land enough to take full advantage of all labour-saving appliances. He will also have to compete in his own markets with the foreign produce of meat, the imports of which, live and dead, have enormously increased in recent years.

Whilst, then, the outlook for the small grain and meat farmer must be considered very discouraging, the question still remains, whether small tenancies or small holdings would not be of advantage, both to those who cultivate them and to the nation at large, if the land were devoted mainly to the production of milk, butter, and cheese, poultry and eggs, vegetables and fruit. In favour of such a system it is pointed out how

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[1] With reference to the above estimate of probable cost, the following statement, which was lately published, may be quoted: "A Freehold Farm in the parish of Whaplode, belonging to Mr. Robert Coupland, comprising a small farmhouse, with barn and bullock hovel and four pieces of excellent arable land adjoining, containing altogether 53 acres 0 roods 38 poles (more or less), has been sold for 2,390*l.* to Dr. Cotton, of London."

large is the annual value of our imports of such smaller articles of production. Thus, the value of the following articles imported into the United Kingdom in 1890 was—

	£
Poultry and game	497,857
Eggs	3,428,806
Butter	10,598,848
Cheese	4,975,134
	£19,500,645
Potatoes	714,257
Onions	724,020
Other vegetables	773,590
Apples	786,072
Other raw fruit	1,806,811
	£4,804,750
	£19,500,645
	£24,305,395

In 1890, therefore, the value of the imports into the United Kingdom, of poultry and game, eggs, butter, and cheese, was 19,500,645*l.*, and that of vegetables and fruit was 4,804,750*l.*, making together about $24\frac{1}{3}$ million pounds.

It is sometimes said that all these at any rate, if not all the grain and meat required for consumption, should be produced at home. In reference to the argument that we should produce more of the staple agricultural products also, it is to be borne in mind that we do at present produce more per acre of both wheat and barley than any other country; more of oats than any excepting one or two of comparatively small area under the crop; also more of potatoes, and a greater weight of live-stock for a given area, than any other country the statistics of whose production are known. If, under our existing system of agriculture, we accomplish this, it is natural to suppose that there is something in our soil and climate, as well as in the habits of the people, compared with those of the countries supplying us with so much of the smaller articles above referred to, to account for the fact that they are able to compete with us in our own markets in the supply of those productions. In most, if not in all continental countries, the success of small holdings depends very materially on whether or not the soil and the climate are suited for the production of what may be called industrial crops, such as tobacco, hops, sugar-beet, colza, flax, hemp, and grapes, also other fruit and vegetables. Where these conditions do not exist, and ordinary rotation crops are relied upon, and especially where, with this, the land is much subdivided,

the condition of the cultivators is such as would not be tolerated in this country.

Belgium is frequently quoted as a model for ourselves in the matter of small holdings, and the production of the smaller articles of comparatively high value. Belgium and England are, indeed, in some particulars, well suited for comparison, but in others for contrast rather than comparison. Thus, Belgium and England have each a much greater population for a given cultivated area than any other European country; and the number is very nearly the same for a given area in the two countries. But, whilst England produces more grain, more potatoes, and a greater weight of live-stock, per acre, than Belgium, Belgium, on the other hand, gives a greater proportion of dairy produce, poultry and eggs, and fruit and vegetables; and small holdings are very characteristic of the portions of the country yielding these results. By far the greater number of the small holdings are in the light land districts, and in those districts the cultivators are, as a rule, not the proprietors. There are, however, some small farms in the heavier land districts, and here the cultivators are frequently the owners also. It is admitted that the larger farms yield a greater produce per acre of ordinary farm crops and stock than the smaller ones.

Owing to the peculiarities of the soil and climate, especially of the great light land district where the small holdings prevail, a very characteristic practice is the growth of two crops in one year. Thus, with a light soil, high summer temperature, long days, and an open autumn, the growth of what we call "catch crops" is a very prominent feature. Under these conditions the harvest is early, and, after the removal of the grain, a catch crop can be taken. After rye, turnips are almost invariably taken; turnips or spurrey after other corn crops, or carrots are sown in the wheat or flax. Indeed, it is stated that, owing to the adaptation of soil and climate, one-eighth of the whole of the cultivated land grows two crops a year. It is fully recognised in Belgium by those officially acquainted with the subject, that the success of the small holdings depends very much on the facts,—that the soil is easily worked, that the soil and climate are such as to favour the practice of catch cropping, and that they are also favourable for the production of industrial crops, dairy produce, poultry and eggs, fruit and vegetables; whilst the dense population generally, and the large number of towns, afford convenient markets for the produce, and for the return of town manures.

Of course, catch crops are not unknown in our own country, but it is only in some of our earliest districts that they could be relied upon. This fact is of itself evidence of a very material

difference in the mutual relations of soil and climate in Great Britain and in the small holding districts of Belgium; and this difference would be very materially to the disadvantage of Great Britain in competition, not only with Belgium, but with other countries, in the production of some of the smaller articles of high value which have been referred to.

In illustration of some of the characteristics of the farming of small holdings under suitable conditions, some facts may be given from a Report published in this Journal [1] of a journey undertaken at the request of the Council of the Society, by the late Dr. Voelcker and Mr. Jenkins, the late secretary, to study the agriculture of Belgium. In the course of their description of a successful farm of ten acres, supporting three or four persons, they quote from the accounts of one year, which showed that besides wheat, dairy and garden produce, &c., an acre of colza sold for 21*l.* 10*s.*, a tenth of an acre of flax for 5*l.* (equal to 50*l.* per acre), and a quarter of an acre of tobacco for 16*l.* (equal to 64*l.* per acre). It will be observed that two out of the three of these are industrial crops, upon which much labour is expended after they are removed from the land.

Then, as examples of small holdings in France, Consul Pauncefote, referring to the district of Nantes, says that the position of peasant proprietors is a miserable one, and that the system of peasant proprietorship is not a good one for getting the value out of the land, and, except under special circumstances, is a very bad one for the proprietor himself from the point of view of worldly prosperity. He says:

"This class never did and never can live by farming as we understand it in England, and the mistake of supposing that they were doing so has arisen from the circumstance that a large population certainly was supported for many years on small patches of land; but they were manufacturers of wine and brandy, not farmers. A man saved up money and bought a piece of ground planted with vines, and employed his labour and that of his family in the threefold occupation of caring for them, making wine, and distilling brandy; and it was the profit from these three operations, two of which are industrial, not agricultural, which enabled him to make a living. The vines have failed, and the towns are filled with those peasant proprietors looking for work, who, instead of having been kept in the country by making them owners, have been ruined by it, and prefer anything else to going back to it. And not only have these people been ruined themselves, but as most of them became owners through the facilities offered by some of the great financial societies in Paris, these establishments have suffered great losses."

Again, the British Consul-General at Havre, in his last report, says:

"The farms are what would be called in England quite small, and the tenants or owners, as the case may be, work excessively hard on them. I think

[1] Vol. VI. (1870), pp. 1–86.

their faces would be a study were they to be told that they were not to work more than eight hours a day on the land. The great advantage the small owner or proprietor has in France is in the difference of climate which favours the growth, &c., of várious articles and small products which do not do so well with us, and sufficient allowance is not made for this when comparison is drawn between the two countries, France and England, and their respective systems."

There are, however, exceptions to such conditions; as, for example, in the Beet-root sugar districts of France, chiefly in the north. There are there hundreds of thousands of acres of sugar-beet, largely grown by the small farmers, who are materially aided in working capital, and consequently in the production and use of manure, by their connection with the sugar industry; and one result of this is that they, as a rule, produce very much greater crops of wheat than the average of the country at large; indeed, on the average, only a few bushels less than the yield of the United Kingdom. But it must not be forgotten that these results have been obtained under the influence of bounties on sugar, and a price of wheat artificially raised by import duties.

If, however, small holdings are to be established to any considerable extent in Great Britain, there can be no doubt that success must be looked for, not in ordinary rotation farming, but in an extension of dairy-farming where the soil and climate are suitable, in an increased production of poultry and eggs, and also, where the soil and climate are suitable, on what is in reality market gardening rather than agriculture. So far as fruit and vegetables are concerned, however, it is to be borne in mind that the high value of the imports of these articles depends largely on earliness and quality, in which particulars it is only in a few limited districts that we could hope successfully to compete with the countries which now supply us with so much of such produce.

Nor can there be any doubt that, so far as land had to be acquired for such purposes as these, as distinguished from ordinary agriculture, such land would, both from its locality and its quality, command a much higher value in the market than has been assumed in the illustration of the requirements of a farm of fifty acres devoted to the ordinary agriculture of the district in which it is situated. On the other hand, a smaller area would, if the soil and climate were suitable, be sufficient to support the holder and his family; but, at the same time, the outlay per acre would be considerably greater. Upon the whole, therefore, although there is certainly much more promise in this direction than in the case of small farms devoted to ordinary rotation crops, it is pretty certain that it would only be under local circumstances as to soil, climate, and markets, specially

suited to the production and sale of some or all of the smaller articles which have been enumerated, that the small cultivator could hope to compete with those who now supply us with so much of them.

It follows, from the facts adduced, that there is little hope that a system of small holdings can ever be carried out in this country to anything like the extent which experience has shown to be practicable in the countries that are so frequently held up to us as models by those unacquainted with the conditions essential to success, or even with practical agriculture at all. Indeed, no one who looks carefully into the facts of the subject, which is pre-eminently a practical one, can entertain any hope that the system of small holdings can be carried out to any such extent as to counteract at all materially the flow of the rising rural populations into the towns.

General Considerations and Conclusions.

There can be no doubt that free trade in corn and other necessaries of life has contributed immensely to the prosperity of the country at large, and of the urban populations especially; though the rural populations have also benefited much from the cheapening of their staple foods. But one of the inevitable consequences of greatly increased imports, and reduction in price, has been to reduce the area under grain crops, and therefore the area under the plough, in our own country; a necessary result of which is, to reduce the labour required to a given area, and so naturally to reduce the rural population. Nor is it very reasonable for the urban populations to complain, if an unavoidable result of the competition with foreign grain producers, and the consequent reduction in price, chiefly in their interest, has been a less requirement for rural labour, which, together with a rapidly increasing population, has led many to leave the country, and either to go into the towns or to emigrate.

It seems, however, to be assumed, in the arguments laid before the non-agricultural public, that we should produce at home not only all the smaller articles of higher value which have been referred to, but even all the grain required, if not even the meat also. Such an argument is too absurd to deserve serious refutation; but it may be well to state some of the results which such a supposition would involve.

Briefly stated, the facts are, that notwithstanding all the emigration that has so far taken place, the population of the

United Kingdom has increased by more than 10,000,000, corresponding to nearly 40 per cent., during the last forty years (1851 to 1891). Under the influence of free trade in grain, so essential for the prosperity of the country in other respects, the area under wheat has, comparing the first four with the last four of the last forty harvest-years (1852–3 to 1891–2), been reduced by about 38 per cent., and the total home produce of the crop has declined in nearly the same proportion. The imports of this staple article of food of the people have, on the other hand, increased by about 300 per cent.; with a result that, whilst during the earlier years of the period only about one-fourth of the wheat consumed was imported, in the later years more than two-thirds have been obtained from foreign sources. Lastly, a very important consideration for the home producer has been, that the price of wheat per quarter has gone down from an average of 57*s.* 8*d.* over the first eight of the last forty harvest-years to only 32*s.* 5*d.* over the last eight years, corresponding to a decline of 44 per cent. It may be added that the average price for the month just past (August, 1892) was below 30*s.* per quarter.

Further, as a natural result of increased foreign competition, and reduction in price, our own area under barley has also somewhat diminished. A result of the reduction of grain area is that, comparing the first five of the last twenty-five years (the period for which official returns are available) with the last five, our total arable area has diminished by about $2\frac{2}{3}$ million acres, though that of permanent grass has in a much greater degree increased, and with this our live-stock has increased, and the total agricultural area has also increased. According to the returns, the area under permanent grass has increased by nearly $4\frac{2}{3}$ million acres, and that of the total agricultural area by nearly 2 million acres; or, to put it in another way, the arable area has diminished by more than 11 per cent., the area under permanent grass has increased by more than 20 per cent., and that of the total agricultural area has increased by more than 4 per cent. But, at any rate so far as the increase in permanent grass, and that in total agricultural area, are concerned, the figures are probably too high, part of the result being doubtless due to the inclusion in later years of areas not previously returned as permanent grass.

It may be observed that a series of unproductive seasons, not only in our own country but in Western Europe generally, which culminated in 1879, but continued for some years later, led to a more rapid reduction in our own area under the crop, and concurrently to the opening up of large wheat-growing areas in various parts of the world, and at the same time to greatly in-

creased imports. But, owing to the great reduction in price consequent on the increased production in various parts of the world, the rate of extension of the wheat-growing areas, especially in the United States, received some check about eight or ten years ago.

It has, indeed, been estimated, judging from the increase of the population in the United States in the past, that the Central, Northern, and Western States, from which we now derive such large supplies of grain, will, before many years have passed, be as densely populated as the Eastern States are now, and that then the export of grain will be rapidly diminished. In this calculation, however, the essential difference in the character of the land in the Eastern States and in the prairie districts of the Central, Northern, and Western States, is not taken into account. At present our imports come chiefly from large areas of formerly prairie land, often as rich as a ploughed-up old pasture in our own country, and frequently so to the depth of some feet. The land is only skimmed, practically no labour is bestowed on cleaning, and a very small produce of grain per acre is obtained compared with that which such land properly cultivated should yield. So long as the population is sparse, the grain is harvested, the straw generally burnt, and the manure of the working stock sometimes floated away on the ice in the rivers or otherwise wasted, and grain is grown for several years in succession. As population becomes more dense, however, local markets will arise for rotation products, stock will be kept, the straw and the manure will be utilised, cultivation will be improved, and there will for some time be more rich prairie land to bring under the plough; so that it is probable that it will be long before increased density of population in those States will materially diminish the capability of production for export. The same may be said of Canada in a less degree; whilst the resources of the rest of the world, taken as a whole, show no signs of diminution.

There can, in fact, be little hope that, with the greatly increased foreign competition that has been so thoroughly established, our own wheat-growing area will ever regain its former proportions; unless, indeed, it should happen, from unforeseen causes, that the price were to range much higher than that which has prevailed in recent years. But to produce the whole of the wheat we require for consumption would involve a vastly larger extension of our own wheat-growing area than this. Thus, the area under wheat in the United Kingdom during the last eight years has averaged rather less than one-eighth of the total arable area, and to produce all the wheat required for consumption, more than one-third of our exist-

ing arable area would be required; or, if the area devoted to other rotation crops were to continue to bear about the same relation to that under wheat as in recent years the total arable area would have to be increased nearly three-fold, making in all much more than our present total arable and permanent grass areas put together! Or, if the wheat were to be grown on a larger proportion of the existing arable area, it could obviously only be by the exclusion of the growth of other grain crops and stock foods, which would then in their turn have to be imported in larger quantities; or our stock must be reduced, and our imports of live animals and meat very much increased.

The above considerations clearly show the absurdity of the supposition that, even with our present population, to say nothing of continued increase, and with proportionally very little possible increase in our own total food-producing area, there is any hope that our imports, at any rate of staple articles of food, can be at all materially reduced. Indeed, when it is considered how rapidly the population and the requirements for its maintenance increase, whilst the aggregate home production (though the produce per acre is greater than in any other country in the world) can increase but little, there can be no hesitation in deciding that, in spite of whatever may be done to increase the produce of the land, at any rate in smaller articles, by the establishment of small holdings or by any other means, the only alternatives are increased emigration, or increased imports of the staple foods of the people. The latter alternative, of course, involves the assumption that if the population remaining at home continues to increase as heretofore, sufficient wages could still be earned by the increased numbers for the purchase of the foreign food required.

Although to establish a large number of the population on the land in small holdings would not only be very costly, but would only to a limited extent, and under favourable conditions, be attended with success, it is nevertheless very desirable that the sale and purchase of land should be rendered as cheap and easy as possible. Further, it would doubtless be for the benefit of the country, that the owner of landed property should be absolute owner, with power to sell, or lease, or will it, to whomsoever he pleases, and that his successor should have the same power as himself. It would, in fact, be desirable to remove all restrictions to the transfer of land, and to its acquirement on equitable terms, so that there should be no artificial obstacles in the way of the small holder, who would then succeed if the conditions were suitable, but would not if they were otherwise. It would, at the same time, be desirable that those who vote the land and

the money for small holdings should also be held responsible for the failures and losses. The country would thus have the security of the instinct of self-preservation in ratepayers, or whoever else was responsible, that large sums would not be expended in utopian, retrograde, and losing schemes.

J. B. Lawes.
J. H. Gilbert.

VERMIN OF THE FARM.—II.

In a former article under this heading (Journal, Vol. III., Third Series, 1892, Part II., pp. 205–231) it was remarked that the vermin of the farm might be arranged in four groups—namely (1) the graminivorous rodents; (2) the insectivorous mole and hedgehog (the shrews being harmless); (3) the carnivorous destroyers of poultry and other live stock; and (4) the so-called winged vermin, which are more or less omnivorous in their habits. Having dealt with the first-named group and with the shrews, it is proposed in the present article to give some account of the mole, of the hedgehog, and of the weasel family, and to refer briefly to the fox and to the badger.

At the present day, when such close attention is paid to details of structure as a guide to the classification of animals, and when in the case of the mammalia the form of the skull and the dentition are so strongly relied upon to distinguish the several orders in that class of vertebrates, it is interesting to find that nearly 300 years ago the peculiar dentition of the insectivorous mole (*Talpa Europæa*) had already attracted the attention of English naturalists. The Rev. Edward Topsel, Chaplain of St. Botolph's, Aldersgate, in his curious *Historie of Four-footed Beastes*, published in 1607, quaintly remarks:

> "I do utterly dissent from all them that holde opinion that the Mole, or Want, is of the kinde of Myse, for that all of them in generall, both one and other, have two large crooked fore-teeth, which is not in Moles, and therefore wanting those as the inseparable propriety of kind, we will take it for graunted that it pertaineth not to that ranke or order of four-footed beastes" (p. 499).

He clearly perceived a difference between the long curved incisors of the Rodentia, or gnawing mammals, and the short sharp front teeth of the insectivora, although he failed to express it scientifically.[1] The distinction, however, to which he alluded

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[1] An excellent paper on the Dentition of the Mole by the late Mr. Spence Bate, with six plates, will be found in the *Journal of the Odontological Society*, 1867 (pp. 261–294). An abstract of it is given in the *Annals and Magazine of Natural History* for June of that year (pp. 377–381).

is one which at the present day is still obviously characteristic, and indicative of the creatures' mode of life. Indeed, we have only to examine a mole attentively to see how admirably its structure is adapted to its habits.

Spending most of its time underground as it does, in tunnels of its own construction, we note first that the cylindrical form of its body must facilitate progress in its burrows; secondly, that the ears, having no external conch, are not liable to be filled with the crumbling soil which is displaced as it works its way underground; thirdly, that the fur being inserted perpendicularly to the surface of the skin, will lie in any direction, and does not prevent a retrograde movement in the tunnel should a retreat in that direction become necessary; fourthly, that the fore-limbs, short, broad, and spade-shaped, are admirably suited for digging; and, fifthly, that the prehensile snout and long jaws, set with sharp teeth, are adapted for seizing, holding, and masticating the earthworms and insect larvæ upon which it chiefly preys.

Keenness of sight not being required in the darkness of its underground chambers, that sense is reduced to a minimum of development; but, contrary to popular belief, the animal is not blind, although the eyes are very minute, and completely buried in the fur which surrounds them.

The sense of smell, on the other hand, is believed to be well developed, to promote the detection of its food, its enemies, and its own kind. The sense of hearing, too, is very keen; it takes alarm at the slightest sound, and will not come forth until all is still again. The mole is not mute, as many people imagine, but, especially when alarmed, can utter a loud and shrill squeak.

Everyone knows, generally, that the mole spends most of its time underground; that it forms "runs" or "galleries" on a more or less definite plan, with a chamber or cavity to live in, and another for the reception of its young.

These facts, which have been described in detail by the French naturalists Le Court and Geoffroy St.-Hilaire, will be familiar to readers of Bell's *British Quadrupeds*, in which work will be found (p. 122, 2nd ed.) a plan of the mole's encampment.

It is not our intention to go over the same ground again in different words, but rather to touch briefly upon such traits in the life history of the mole as have been overlooked by previous writers, and especially to consider the question of its utility or harmfulness in regard to agriculture.

As a rule, perhaps, it may be asserted that the mole is partial to light soils, which are easily worked, such as old

pasture, park lands, warrens, and downs, but it may also be found in barren lands, on clay soils, and on hills.

Whether the mole is injurious or not from an agriculturist's point of view is a question upon which, probably, there will always be a difference of opinion. Many farmers will state that mole-hills are not only very unsightly, but that they prevent the mowing grass from being properly cut. They apparently overlook the fact that if the hillocks were broken up, and the fine soil of which they are composed were spread over the surface, they would have an excellent and inexpensive top-dressing for their fields. Another recommendation lies in the fact that some amount of surface drainage is effected by the moles' "runs"; while a third, and perhaps the most important consideration, is the fact that the mole preys not only upon earthworms but also upon the larvæ of many coleopterous and dipterous insects, which are very destructive to the roots of grasses and other field crops. On this account, then, if on no other, it surely deserves protection. The late Mr. Henry Reeks, of Thruxton, near Andover, who was a practical farmer as well as a good naturalist, was strongly in favour of sparing the moles upon agricultural land.[1]

The quantity of worms which a mole will consume in a day is very considerable. The late Mr. William Thompson, of Belfast, wrote: "I examined the stomach of a mole, and found it entirely filled with earthworms. One or two, which were quite perfect, were of the short thick species with a yellow band round the body."[2] These must have been swallowed whole, as an Italian would eat macaroni. The late Edward Alston, who kept a mole for some time in confinement, was quite surprised at its voracity, and was of opinion that it would devour more than its own weight in a day.[3] In its eager pursuit of earthworms, the mole has been observed to follow them above ground (*Zoologist*, 1883, p. 76), and on wet and dewy evenings to hunt above ground, like a dog, for worms and field-slugs (*Zoologist*, 1872, p. 3182). A mole-catcher informed Mr. Jesse that, previous to the setting in of winter, the mole prepares a sort of basin in a bed of clay, which will hold about a quart, and in this it deposits a quantity of earthworms, partly mutilated to prevent their escape. On these worms it feeds during the winter months. The mole-catcher added that when he found few of

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[1] See *Zoologist*, 1872, pp. 3181–2.

[2] *Natural History of Ireland*, vol. iv, p. 4.

[3] This has been observed of other animals, as for example the woodcock and snipe, when kept in confinement.

these basins in autumn, he knew the winter would be a mild one.[1]

Another view, however, has been expressed with regard to these stores, namely, that they are made as provision for the young which are born in March and April (*Zoologist*, 1875, p. 4493). The observer examined a round cavity the sides of which were beaten hard by the mole, so as to prevent the worms from attempting to pierce their way out. Inside this there was nearly a quart of fine worms, quite free from any admixture of soil, each worm coiled up in a knot, yet all alive. There is no direct evidence to show that these were intended as provision for the young, which would probably be suckled by the parent until able to shift for themselves. It is more likely that they were intended for a winter store, to which the mole can resort when the ground is too hard for tunnelling. It is doubtful, however, whether the worms could live long in such a condition, for if unable to make their escape, they would themselves die for want of nourishment.

According to Jesse, who probably derived his information from the practical mole-catcher already referred to, the period of gestation in the mole is a month, and from two to six young are produced at a birth. The nest, which is formed by excavating and enlarging the point of intersection of three or four passages, is generally lined with dry grass or dead leaves, sometimes with moss, and even fur. The young ones begin to run in about five weeks, when they are about three parts grown, and follow the parent for some time.

Moles are by no means averse to water. They will not only cross ditches and small pools, but have been observed boldly swimming across rivers.

In their journeys above ground they naturally meet with many enemies, such as owls, buzzards, and weasels. The fact that they are preyed upon by owls has been determined by an examination of the "pellets" or "castings" which these birds throw up of the indigestible portions of their food. A German naturalist, Dr. Altum, once examined 210 pellets which had been rejected by the tawny or brown owl, and in these he recognised (amongst the bones of rats, mice, voles, and shrews) the remains of no less than forty-eight moles. Buzzards also prey upon moles, watching for them to work towards the surface, when they pounce down, and, digging their claws into the moving soil, secure them often while still out of sight.

It was long ago remarked by Gilbert White (in his fortieth

[1] *Gleanings in Natural History*, 2nd series, p. 26.

letter to Pennant) that weasels prey upon moles, as appears by their being sometimes caught in mole-traps. This, of itself, would not be conclusive, for weasels thus caught might have been in pursuit of field-mice, which often make use of the moles' "runs"; but instances have been recorded in which weasels have been seen carrying dead moles in their mouths.[1]

If moles, therefore, are considered by agriculturists to be injurious to their interests, the above-named natural enemies of the mole should be regarded as deserving of protection. For the reasons already mentioned, however, we should be disposed to spare both, and leave the adjustment of affairs to Nature.

There is less to be said in favour of the hedgehog (*Erinaceus Europæus*); for although it belongs to the same order of insectivorous mammals as the mole, the observations of naturalists abundantly prove that its diet is by no means confined to insects. Its food, in fact, is extremely varied, and while it evinces a partiality for field slugs, snails, worms, and beetles, there is no doubt that it preys also on eggs,[2] chickens,[3] young landrails,[4] mice, young rabbits,[5] leverets,[6] frogs, snakes,[7] and even vipers.[8]

It destroys not only partridges' and pheasants' eggs, but also the eggs of poultry and ducks. On this point a writer in the *Field* gives the following account of his experience:

"Within the last few weeks (June, 1874) two distinct cases have come under my own observation, that in my mind have conclusively settled the question. The first is this: I had a tame duck laying under some tops of trees (that had been recently felled) in the wood where I reside. There were five eggs in the nest. On the following morning there were only two and a piece of shell. On the following night I put down a common rabbit trap at the nest, let into the ground, and covered over. About ten p.m. I heard something crying out (similar to the noise made by a hare when in distress). Upon going there I found a very large hedgehog in the trap. I took it out, killed it, and set the trap again. About eleven p.m. there was another large hedgehog in the same trap, which I killed, and set the trap again. I went again the next morning at five a.m., and found another large hedgehog in the same trap, making three hedgehogs the same night caught at the same nest. Since then the duck has been sitting in the same nest, undisturbed by anything. The second case occurred last week. One of my men came to me with a face as long as a fiddle. 'Master,' says he, 'the crows have been and spoilt a pheasant's nest that you knew of down the

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[1] *Field*, July 9, 1881, and May 1. 1886.
[2] *Ibid.*, June 6, 1874; *Zoologist*, 1883, p. 115.
[3] *Gardener's Chronicle*, 1846, p. 480.
[4] *Zoologist*, 1883, p. 25.
[5] Thompson, *Nat. Hist. Ireland*, vol. iv. p. 3.
[6] *Gardener's Chronicle*, *l. c.*
[7] *Zoological Journal*, vol. ii. p. 19.
[8] *Zoologist*, 1887, p. 306.

wood, by the withy bed.' I asked him if he was sure it was crows. 'Come and see for yourself,' was the answer. I went, and sure enough there were nine eggs destroyed out of fifteen. They appeared to have been bitten half through. It then came to my mind about the hedgehogs eating the duck's eggs, and I was determined to find out and prove what it was destroying these eggs. I took the remaining six eggs home, and inserted a very small quantity of strychnine into each egg, and sealed them up again, and took them back to the nest where the others were destroyed. The next morning the man and I went to see if anything was there, when we found an immense hedgehog flat on his belly, and very much swelled up, not a yard from the nest, and quite dead, and as if in the act of crawling away from the nest. Only two of the eggs were partially eaten. Is not this conclusive evidence that the hedgehog is a great enemy to the pheasant and partridge?"

Many similar instances might be quoted.

Of its partiality for frogs the writer has been an eye witness. Some years ago he had two live hedgehogs which were tame enough to feed in his presence without manifesting any fear or timidity, and if he wished to make them lively, he had only to introduce a frog into their hutch to rouse them to a pitch of excitement. They would then rush upon the unfortunate frog, and, fighting for it like two dogs over a bone, would tear it limb from limb and quickly devour it. Needless to say that, after the first frog had been introduced alive by way of experiment, on subsequent occasions the frogs were supplied dead; but the sequel was the same. The method of killing a snake was very different and displayed more caution, as if they were apprehensive that the snake might retaliate. The hedgehog would give the reptile a sharp bite, and then roll itself up in a ball; after an interval, a second bite would be inflicted, and again the animal would roll up; after three or four such bites, the snake would be paralysed, perhaps dead, or very nearly so, and after another pause the hedgehog would commence to eat the snake, beginning at the tail and munching it up as one would eat a stick of celery. With a viper, still more caution is displayed; for the latter invariably strikes at the hedgehog on being bitten, and it requires a remarkably quick "shut up" to avoid the viper's fangs. The result in this case is very different; the viper repeatedly strikes against the sharp spines of the hedgehog, and in so doing becomes lacerated to such an extent that it eventually succumbs to its self-inflicted injuries.

The late Colonel J. Whyte, of Sligo, made some interesting observations, which are worth quoting, on the hedgehog's mode of hunting, and the pace at which it can travel. He says:

"It so happens that there is an inner yard in my house, well flagged, about 35 feet square. Into this I turned a hedgehog the other day, and can see everything he does. I was much surprised to see the pace he goes, and

the amount of exercise he takes. So far as I can ascertain, from the time darkness sets in up to six o'clock in the morning he never stops going, trotting along at a good six miles an hour, not round and round the walls, but beating and quartering the yard as well as any pointer ever did a field, evidently looking for food; and, at the rate he goes, he could beat every inch of twenty acres in a night.

"His eyesight appears to be bad, but his hearing and nose are exquisite. Touch a window, and he stops instantly, well on his haunches, his head up, and the bristles protruding from his forehead, looking just like a little boar at bay; when, having listened for a while, off he trots again as hard as ever, standing higher on his legs, and having a longer tail than you would expect. Nor—though you may be looking at him from a window not a yard over his head—does he take any notice, if you make no noise.

"Throw a small bird immediately before him as he runs, and he seems to take no notice of it—the scent has not had time to emanate. Away he goes, quartering the yard, and passes, perhaps, 8 feet or 10 feet from it at the next turn. The air, however, has driven the scent that way, and as he crosses it he stops as dead as Mr. Laverack's best dog. No pot-hunter is Master Piggy; up goes his head, the end of his nose twisting about in a curious way; round he turns, and higher he stands on his toes, until he has made out the direction of the game; and then he walks straight on and forthwith proceeds to devour it. Nor is his mouth so small as is generally supposed. He can take a small bird clean into his mouth, and crack its bones like any cat."

In connection with the food of hedgehogs, another point deserves a passing notice. "The manner in which they eat the roots of the plantain in my garden," says Gilbert White, "is very curious," and he proceeds to describe it. This passage is quoted by Bell in the second edition of his *British Quadrupeds* (1874) without contradiction; but the author of the *Letters of Rusticus* found this to be a mistake. He discovered that it was not the hedgehog, but a night-feeding caterpillar, which devoured the root upwards, leaving the tuft of leaves untouched.

Unlike many of the rodents, the hedgehog lays up no stores for the winter, but passes that season in a state of hybernation or torpor, rolled up in a snug nest of dead leaves, grass, and sometimes moss. Bell states in his *British Quadrupeds* (2nd ed. 1874) that "the female hedgehog produces from two to four young early in the summer," but two corrections are needed in this statement. The number of young is oftener five or six (we have known two cases in which seven were found in a litter), and the young are produced in autumn as well as in early summer.

Looking at the facts here adduced, and reviewing the animal's bill of fare, it can scarcely be said that the hedgehog is harmless. On the contrary, an impartial consideration of its habits leads to the conclusion that it is not unreasonably included amongst "Vermin of the Farm." But, like every living

creature, it has its natural enemies, and few people are aware probably that its chief enemies are the badger and the fox. Where they dwell hedgehogs are not likely to become too numerous.

Graver doubts arise in including in the same category with the hedgehog the little weasel, *Mustela vulgaris* (fig. 6). It is true that it is a strictly carnivorous animal, bloodthirsty, active, and very courageous, often attacking creatures larger than itself;

FIG. 6.—The Weasel, *Mustela vulgaris.*

but, like other animals, man included, it has a *spécialité*, and that is a natural antagonism to rats, mice, and voles.

So frequently have we witnessed its pertinacity in mouse-hunting, that, on this score alone, we should be inclined to forgive him for occasionally carrying off a chicken. We would even go a step farther. We have known stackyards in which weasels were repeatedly seen and left unmolested. Hens with chickens were daily pecking about the yard, but no chickens were missed. It appeared that so long as the weasels could get mice and rats, they preferred fur to down or feathers.[1] Many a time have we seen a weasel carrying a dead field vole in

[1] This is otherwise with the stoat, which is often confounded with the weasel, and people frequently "put the saddle on the wrong horse."

its mouth, as a retriever would carry a rabbit, advancing sometimes on a narrow field-path, and almost disputing the right of way. On one occasion when out partridge shooting we came across a weasel in the open, far from any hedgerow. It could not escape; we stood perfectly still and it ran towards us. When almost at our feet we touched it with the gun-barrels, and instead of showing fear it sprang at the barrels, which it vainly clawed and bit in the most angry mood at finding its progress stopped. Of course it was allowed to escape.

The female weasel is much smaller than the male, and is doubtless "the little reddish beast not much bigger than a field-mouse, but longer," which Gilbert White mentions as being called "cane" by the country people in Hampshire. In East Sussex it is called "beale"; in Yorkshire "ressel" or "rezzle" (probably a corruption of "weasel"); in Norfolk "mouse-hunter" or "mouse-hunt"; in East Suffolk "white-throat" (male) and "mouse-hunt" (female).

A young weasel is very helpless for some time, and will remain where dropped by the parent if she is disturbed when carrying it, as she does, in her mouth. There are usually four or five in a litter, occasionally six, and they are deposited in a warm nest of dry grass and leaves, generally in a hole in a bank, or loose stone wall, or in the hollow of some tree root. If they are discovered before they are able to take care of themselves, the old one will defend them, and will courageously fly at the nose of any dog who looks in upon them.

Weasels, like stoats, hunt by scent, and their small, lithe bodies enable them to follow rats and mice along their "runs" and through very small holes. Nor can the latter often escape by climbing; for the weasel has been observed up a tree about 12 feet from the ground, and has been even known to make its nest in a hollow tree. One was seen to jump from the top of a limestone pit into some water 30 or 40 feet below and swim across the pool. For both weasels and stoats can swim well; we have often seen them crossing a stream voluntarily. Sometimes they would carry a young one across, sometimes a dead field-mouse. On one occasion a weasel was observed to cross a river at high tide, where the water was 50 or 60 yards wide.

Unlike the stoat, the weasel never turns white in winter, though a few instances are on record of an albino weasel having been killed. We have seen four such albinos which were procured in widely separated localities, and were pure white with pink eyes.[1]

[1] Dr. J. Ritzema Bos, whose work, *Tierische Schädlinge und Nützlinge für Ackerbau*, is reviewed in this volume of the Journal (Part II., 1892, page 415),

The stoat (fig. 7) may be always known from the weasel by its larger size, and by its invariably having a black tip to its tail, which the weasel never has. The stoat's tail also is much longer in proportion to its body.

As may be supposed from their relationship, their habits are much the same, the chief difference of course being that the stoat, from its larger size, is able to prey upon larger animals. It will also carry off a hen's egg between its chin and breast, holding it in this manner quite securely, while the paws being unencumbered, it is able to beat a retreat. Like the weasel, it hunts by scent, and will even follow its prey into the water. One evening in July Mr. T. J. Mann, while walking by the side of a stream in North Norfolk, was attracted by the noise made by some water-rats in the grass some ten yards distant from where he stood. Two rats jumped into the stream, which was about 20 feet wide, closely followed by a stoat, which swam quickly though jerkily in pursuit, but the rats on this occasion made good their escape.

We have watched stoats hunting both rats and rabbits, and were once witness to a most determined fight, on a road which crossed a Sussex common, between an average-sized stoat and an enormous rat, which was certainly much heavier than its adversary. This fight, which was a trial of "weight *versus* science," ended in favour of the stoat, which killed its adversary and dragged it off the road into the furze on the common.

The change of colour which the stoat undergoes in winter is the more curious when we consider that no such change takes

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observes that, whilst various mammals and birds of prey are mentioned as destroyers of the field-mouse, none are so useful in this respect as the little weasel. Chiefly during the night—especially in abundant mouse years—but also to some extent in the day, it is busily occupied in catching field-mice. As soon as the slender little carnivore creeps into a mouse-hole, the terrified rodents may be seen springing up, as if possessed, from the neighbouring burrows; but the weasel has speedily seized a mouse by the throat, and has bitten into the arteries of the neck, so that it may taste the blood of its victim. Inasmuch as the weasel, like other members of the marten family, only eats its prey when in need, being usually satisfied with merely drinking its blood, it requires many field-mice for its daily food. There thus comes upon it a delight in killing, so that even when satiated it still goes on killing for mere pleasure. Hence it is that a single weasel may easily destroy two dozen field-mice, or it may be more, in the space of one day. When the weasel has young it drags many dead mice into its nest. As destroyers of field-mice, the weasels excel over other similar animals of prey—firstly, by their far greater number; secondly, by their slender, snake-like, active bodies, which enable them to search as no other animals can for the field-mice in all their holes and burrows; and thirdly, by the circumstance that they continue the destruction of mice through the winter. In years when field-mice are exceptionally abundant, there appears to be a second litter of young weasels in the early autumn months.—ED.

place either in the weasel or in the polecat, both members of the same family.

Bell, in his *British Quadrupeds* (2nd ed., p. 196), states that "this is effected not by the loss of the summer coat and the substitution of a new one for the winter, but by the actual change of colour in the existing fur." On the other hand, the late Henry Wheelwright, better known as a writer on natural history under the signature of "The Old Bushman," has asserted just the reverse, stating that he had proved it by keeping specimens in confinement.[1]

There are other statements by Bell which are likewise open

FIG. 7.—The Stoat, *Mustela erminea.*

to criticism, as for example his remark (*op. cit.* p. 196) that the change to white "arises from a similar cause to that which produces the grey hair of senility in man." But in man, after the change to grey or white, the normal colour is never resumed, while in the stoat it is otherwise. Again, he observes that "the access of very sudden and severe cold has been known to produce the winter change." But even in the south of England stoats have been found to have undergone a partial change to white long before the advent of winter. In 1887 we received

[1] *Ten Years in Sweden*, p. 219. This was also the opinion of the late Edward Blyth, one of the most experienced zoologists of modern times.

a pure white one which had been shot near Usk, Monmouthshire, on August 3.

In Ireland, where the weasel is stated to be unknown, though it has been reported to have been seen in Mayo by a reliable observer (*Zoologist*, 1877, p. 291), the stoat is comparatively common, and is universally known as the weasel. It is systematically hunted under this name in the county of Cork, where the dogs used are called "Weasel-hounds."[1] Just in the same

FIG. 8.—The Polecat *Mustela putorius.*

way is its larger relative, the polecat, hunted with hounds in Cumberland, Westmoreland, and parts of Lancashire.[2]

The polecat, *Mustela putorius* (fig. 8), is as superior in point of size to the stoat as the latter is to the weasel. It has longer and much darker fur, and, in proportion to its size, a comparatively shorter and more bushy, though tapering, tail. It is in fact so like the brown variety of the ferret that it might easily be mistaken for it. That the ferret is a domesticated variety of the polecat there can be no doubt, although these are frequently described in natural history books as if they were distinct

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[1] See the *Irish Sportsman* of May 7, May 21, and June 4, 1892.

[2] For a description of this mode of hunting, see the *Zoologist*, 1891, pp. 286–289.

species. It has been found, however, upon a careful comparison, that there are absolutely no cranial, dental, or other characters by which they can be distinguished.

The three species of British *Mustelidæ* are so often confounded by those who have had no opportunities of studying them, that figures of all of them are here given for the purpose of comparison. From these it will be seen at a glance how different they are in appearance. To complete the group a figure of the marten might have been added, for this is in point of fact an arboreal weasel; but it is now so rare an animal in the British Islands, restricted to some of the wilder parts of the north and west of England, Wales, Scotland, and parts of Ireland, that it has at the present day little or no claim to be regarded as one of the "Vermin of the Farm."

Of the three other species of the family to which attention has been directed, it is difficult to say a good word for any but the weasel, which unquestionably renders good service by destroying great numbers of mice, rats, and voles, and on this account should be allowed to go free about the stack-yards and farm-buildings.

The stoat and the polecat, from their larger size as well as by their strength and courage, are enabled to kill, and do kill, much larger prey in the shape of chickens, fowls, ducks, and game, whenever opportunity serves, and it is therefore impossible to gainsay the complaints of farmers and gamekeepers who inveigh against this exercise of their natural propensities.

There was a time, however, before the days of "game-preserving" as now carried out, when stoats and polecats lived side by side with pheasants, partridges, grouse, hares, and rabbits; and the toll which they took of them evidently did not result in the extermination of any of the species, or even in a visible decrease in their numbers. On the contrary, there is reason to believe that by killing those which were most easily captured, by reason of their being less robust and active than their fellows, a process of natural selection was carried out which resulted in the "survival of the fittest," and the consequent improvement of the race.

Another plea may be urged in favour of the polecat. Farmers who, under the operation of the Act of 1880, have a concurrent right to the ground-game upon the land in their occupation, have now and again to consider the advantage of possessing good ferrets for rabbiting. Experienced warreners aver that, to improve the breed of ferrets, there is nothing like a cross with the wild polecat. It is as well, therefore, not to carry the destruction of vermin too far in the case of an animal

which, in spite of its carnivorous propensities, has at least one good quality to justify its protection.

Of the remaining animals on our list, the fox and the badger, neither can be properly included amongst "Vermin of the Farm," although both, from their carnivorous nature, undoubtedly prey upon poultry, game, and rabbits.

But so long as the old English sport of fox-hunting is maintained—and long may it flourish—who will be bold enough to advocate the destruction of foxes in any other way than by hunting with hounds, merely because they carry off every year an uncertain number of ducks and fowls?

It will be some consolation to those who suffer occasionally from the depredations of foxes to know that this animal does not prey exclusively on game and poultry. On the contrary, its "bill of fare" is extremely varied. It would be absurd to assert that foxes do no harm in game preserves; but it is doubtful if they do half the damage laid at their door, that is if the keeper does his duty properly. The breeding season of the birds is the time when vixen foxes have to get food for their young, and during that period the gamekeeper, having orders to preserve foxes and pheasants (the two things by no means incompatible), should supply the foxes with rabbits and rooks. If this be done birds will seldom be touched. For their own eating an old fox of either sex will rarely, if ever, take a sitting hen, though, if other food be not provided, the vixen will sometimes catch up a hen pheasant for the sake of her young. By the time the cubs are big enough to earn their own living the pheasants will have taken to roost in trees, and be out of the way of foxes. Still, we do not say that where pheasants abound a few will not fall a prey to foxes, especially when there is a dearth of rabbits.

Foxes are very fond of field-mice, and will dig out and eat scores of them, in this respect rendering good service to farmers. The hedgehog likewise falls a prey to the fox, as it does also to the badger. In default of fresh food a fox will feed on carrion, and will even devour dead fish cast up or left upon the shore.

A good trait in the fox which is deserving of notice is that he generally abstains from poaching in the immediate neighbourhood where he is protected. Many instances of this have been ascertained, not only in relation to poultry and rabbits, of which foxes are particularly fond, but also in the case of lambs. The hill shepherds assert that they have often known a fox to have his earth on their ground, but never to kill any lambs save at a distance from home. This may savour of gratitude for the protection afforded him, but it is probably merely an illustration

of the animal's hereditary cunning which prompts him to avoid leaving traces of his work which might lead to the discovery of his lair.

A remarkable illustration of this occurred in Shropshire in 1881. On May 13 in that year Mr. Charles Nock, of Norton House, Shifnal, wrote that an old dog-fox, a vixen, and three cubs about three months old, had that day been unearthed in his poultry-yard. They were only thirty-eight yards from the house door, and twenty-two yards from the poultry-house, and although ducks and fowls were all round and about the den, not one was killed or molested.

A somewhat similar case was reported in August, 1887, by Mr. B. Morris, of Bucklers, Great Tey, Essex, of a fox which had its earth in an old haulm wall in a roadside farmyard.

As badgers are by no means so numerous as foxes, and in most parts of the country are decidedly scarce, there is the less reason for laying stress upon their depredations on the farm.

The food of the badger is of a very miscellaneous nature, animal as well as vegetable. Roots of various kinds, the bulbs of the wild hyacinth, earth-nuts, beech-mast, acorns, fungus, blackberries, birds' eggs, field-slugs, snails, earthworms, beetles, frogs, snakes, field-mice, moles, and rabbits have all been ascertained to form part of the badger's "bill of fare." Even the hedgehog falls a prey to the badger, by which it is easily killed notwithstanding its defensive armour.

The question is sometimes asked whether the badger is destructive to game. Keepers have been heard to say that they would rather have half a dozen foxes in a wood than one badger, for the latter disturbs the place by working about in all directions. But as the pheasants are all at roost by the time the badger comes out at dusk, and the rabbits are out of the coverts "at feed," there cannot be much harm done, except when the hen pheasants are sitting, some of which or their eggs very likely fall a prey to badgers as they do to foxes. No doubt in this way a badger now and then gets hold of a sitting bird, but winged game can generally keep out of its way; and we have observed that in certain old woodlands well known to us, where badgers are common, game is also plentiful.

There is no doubt that badgers are fond of young rabbits, and will dig down upon them from above and scrape them out. The holes thus made may often be seen, where badgers abound, with the prints of their feet and the marks of their strong claws, whilst occasionally some of their grey hairs are found sticking to the soil.

One of the chief pleasures to be derived from a study of natural history is the observation of the habits of wild creatures in their natural haunts; and amongst other adventures in this direction, it has been our fortune to sit out in the woods at night, at a distance from all human habitation, and to watch the badger leaving its "earth." On one occasion we saw three badgers at play about twenty yards up-wind of where we were sitting. A most interesting sight it was, and the recollection of it, as we write, prompts us to say a good word for an ill-used because little known animal.

The badger, if taken young, may be easily tamed, and makes a curious and interesting pet. It is very cleanly in its habits, and, if fed on dog-biscuit and bread and milk, may be allowed the run of the house; though only at dusk, for during the day it should be allowed to sleep in its kennel within a walled yard, where it can be safely locked up. Several friends who have tried the experiment have succeeded beyond their expectations; amongst them a lady in North Wales, who has had a tame badger for nearly three years. This badger accompanies her in her evening walk across the fields and through the woods, without attempting to escape, hunting for beetles, field-slugs, and worms, of which it is very fond, and returning from a distance when called. Should a shepherd with his collie approach near enough to risk an encounter, the badger is lifted up in the arms of its kind mistress, and held until the danger has passed. The country children, on seeing her, exclaim: "There goes Miss L. and her funny dog." They do not know the badger in its wild state (though the animal is common in the neighbouring woods), for its nocturnal habits screen it from general observation.

It is satisfactory to think that, owing to the more extended teaching of natural history, popular prejudices in regard to certain wild animals are being gradually removed. Not only has "badger-baiting" become well-nigh a thing of the past, but certain country gentlemen, whom we could name, have lately gone so far as to restore the badger to its ancient haunts in old woodlands, where, through unreasoning persecution, it had long become extinct. Let us hope that their confidence in its good behaviour may not prove to be misplaced.

J. E. HARTING.

THE WARWICK MEETING, 1892.

A GENERATION has passed away since, in the year 1859, the Royal Agricultural Society held its previous Meeting in the county town of Warwickshire. The only other occasion on which the Society has paid a visit to the county which claims to occupy the "heart of England," was at Birmingham in 1876. The annual exhibition of the Society has, therefore, now been held three times in Warwickshire. Some details of these three Meetings are collected in the subjoined statement:—

Year	Place of Meeting	President	Stock exhibited	Number of implements exhibited	Number of persons admitted
1859	Warwick	Duke of Marlborough	1,159	4,618	55,577
1876	Birmingham	Lord Chesham	1,499	6,414	163,413
1892	Warwick	Earl of Feversham	1,858	5,430	96,462

THE SHOW-GROUND.

It is doubtful if the Country Meeting has ever been held amidst more picturesque and charming surroundings than, thanks to the kindness of the Earl of Warwick, were provided in Warwick Castle Park. The former Meeting, three-and-thirty years ago, was held on the racecourse. The Showyard then occupied an area of 30 acres, whereas on this occasion 90 acres were enclosed. The approach to the ground from the town of Warwick was along the Banbury Road, which, with its beautiful hedgerows and stately trees, is in itself a delightful promenade in the leafy month of June. Half-way between the town and the Show-ground this road crosses the river—Shakespeare's Avon—by Castle Bridge, the view from which of Warwick Castle extracted spontaneous tributes of admiration from thousands of visitors during the week. The entrance gates of the Showyard opened into a large expanse of green-sward, where a number of fine trees afforded grateful shade. Facing the visitor as he stood within the entrance were seven broad avenues, which, passing amongst the exhibits of implements and machinery, terminated in a broad transverse avenue. Beyond this, as is seen from the plan on page 481, was the shedding for live stock. From the middle of the Horse Ring, situated at one side of the ground, a magnificent view along the transverse avenue was afforded of the Castle, the grey summits of which rose up grandly above

the dense masses of foliage which clothed the grassy slopes on the other side of the Avon. In the earlier part of the day, when the sun was shining upon the Castle, the spectacle was specially imposing, and it quickly established itself in the public favour as one of the "sights" of the Show. The Park is well timbered, and the Surveyor succeeded admirably in his efforts to give the greatest effect to the natural facilities he found at his disposal. A conspicuous object in the midst of the live stock section was the belt of timber called Lord Brooke's Clump, on one side of which the Dairy Cattle were stalled.

The ground, being fairly level, was easy for travelling, and the surface remained in excellent order throughout the week. The shape of the yard was, moreover, such as to render all parts easily accessible.

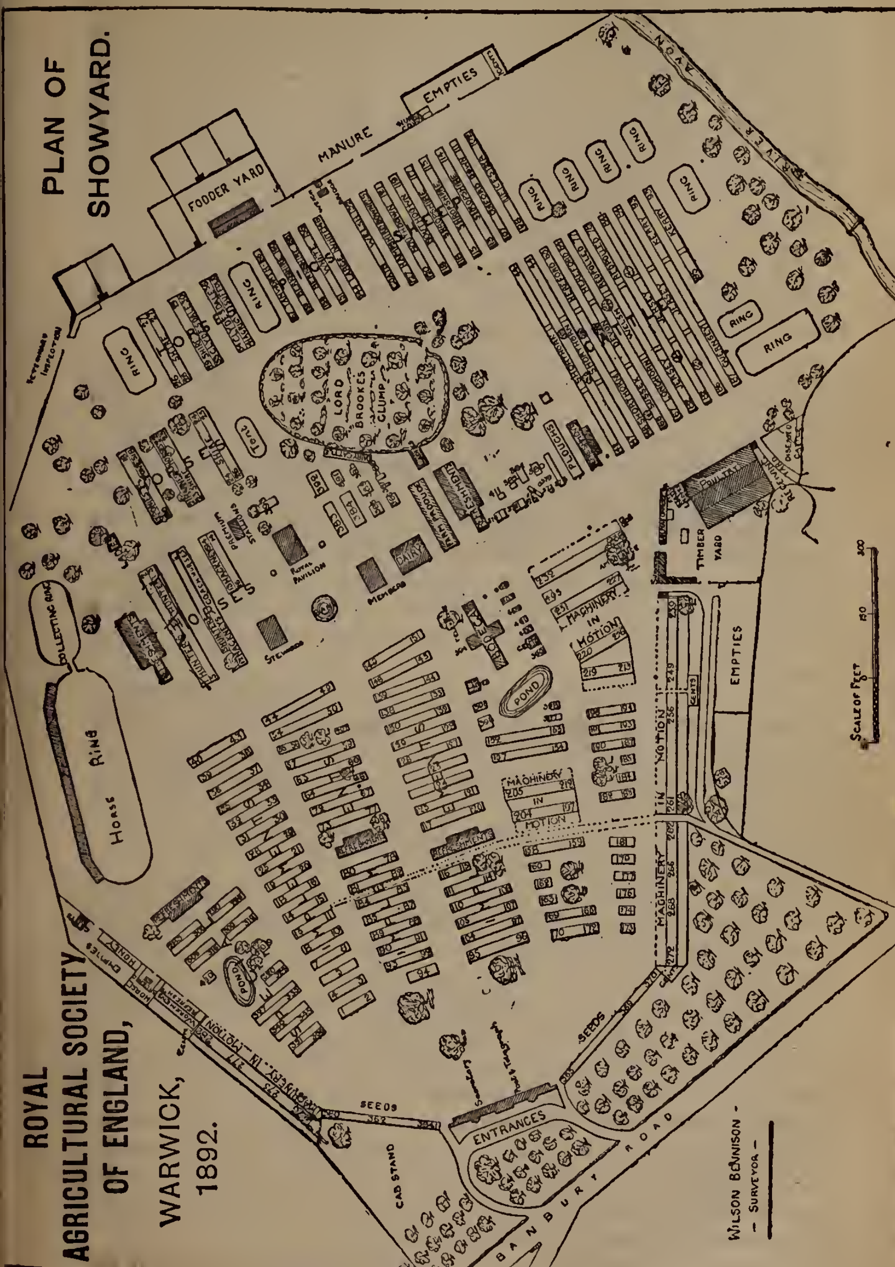
Entries.

Subjoined is a Table of the entries at the Warwick Meeting, together with those of the preceding eight years:—

Number of animals entered	Warwick, 1892	Doncaster, 1891	Plymouth, 1890	Windsor, 1889	Nottingham, 1888	Newcastle, 1887	Norwich, 1886	Preston, 1885	Shrewsbury, 1884
Horses	449	717	333	996	516	500	493	438	407
Cattle	607	669	642	1,644	644	626	681	539	579
Sheep	600	649	571	1,109	537	513	416	433	490
Pigs	202	205	223	265	148	194	203	203	211
Total	1,858	2,240	1,769	4,014	1,875	1,833	1,823	1,613	1,687
Poultry	835	789	695	861	343	405	191	325	—

Shedding in Implement Yard (in feet) [exclusive of open-ground space]	Warwick, 1892	Doncaster, 1891	Plymouth, 1890	Windsor, 1889	Nottingham, 1888	Newcastle, 1887	Norwich, 1886	Preston, 1885	Shrewsbury, 1884
	feet	feet	feet	feet	feet	feet	feet	feet	feet
Ordinary	8,241	8,343	6,117	10,378	7,253	5,508	7,155	8,417	9,315
Machinery in motion	2,151	2,106	1,291	2,496	1,607	1,125	2,017	2,063	2,035
Special shedding (including seeds, models, &c.)	2,119	2,024	1,670	2,728	1,883	1,584	1,640	1,520	1,554
Total	12,511	12,473	9,078	15,602	10,743	8,217	10,812	12,000	12,904

It will be seen from this statement that the aggregate entry of live stock at Warwick compares favourably with that at ordinary Meetings of recent years, the lesser total as compared with Doncaster being chiefly attributable to the smaller number of horses. It was not, however, to be expected that horses would come forward in such numbers as they did in the more


PLAN OF SHOWYARD.
ROYAL AGRICULTURAL SOCIETY OF ENGLAND, WARWICK, 1892.
FODDER YARD
MANURE
EMPTIES
RING
LORD BROOKES CLUMP
ROYAL PAVILION
MEMBERS
DAIRY
STEWARDS
PLOUGHS
POND
MACHINERY IN MOTION
TIMBER YARD
POULTRY
HORSE RING
SEEDS
ENTRANCES
CAB STAND
BANBURY ROAD
RIVER AVON
SCALE OF FEET
WILSON BENNISON - SURVEYOR -

characteristically horse-breeding locality of Doncaster, in 1891. The Cattle section was distinguished by the large entry of Shorthorns and Jerseys, and the exhibition of Sheep has established a claim to recollection on account of the grand and successful effort of the breeders of Shropshires, the result being one of the best displays of the West Midland breed that has ever been brought together.

A Retrospect.

A comparison of the Warwick Meetings of 1859 and 1892 brings to light many points of interest. The entries of stock are shown in the following statement:

	1892	1859		1892	1859
Horses	449	212	Sheep	600	697
Cattle	607	411	Pigs	202	236

Whilst horses competed in nine sections this year, they were scarcely differentiated in 1859, on which occasion they were all dealt with by two sets of Judges. The prizes then went to animals variously described as "Agricultural Stallion," "Suffolk Agricultural Stallion," "Suffolk Agricultural Mare," "Suffolk Agricultural Filly," "Clydesdale Agricultural Filly," "Dray Stallion," "Dray Mare," "Dray Filly," "Thoroughbred Stallion for getting Hunters," "Mare for breeding Hunters," "Mare for breeding Hackneys."

In 1859, cattle were grouped as Shorthorns, Herefords, Devons, pure Longhorns, and "other established breeds." Under the last named head, prizes were awarded *inter alia* to a Jersey bull, a polled Angus cow, and a Norfolk polled heifer. In a section for "Cattle best adapted for Dairy purposes," the prizes, a dozen in all, were awarded exclusively to "Short-horned" bulls, cows, and heifers.

The only breeds of sheep specifically classed in 1859 were Leicesters, Southdowns, and Shropshires. In a group described as "Long-woolled (not Leicesters)," all the prizes were taken by Cotswolds. In another section, "Short-woolled (not South-downs)," prizes went to West Country Downs, Oxford Downs, Shropshires, and Improved Hampshire Downs.

Pigs were a heterogeneous assemblage thirty-three years ago, for we find in the prize list animals described as "large breed boar," "large breed Berkshire boar," "large breed Improved Yorkshire boar," "large breed Carhead sow," "large breed Improved Chilton sow pigs," "small breed Windsor boar," "small breed Suffolk boar," "small breed Essex boar," "small breed Improved Essex sow," "small breed sow."

In the Produce Classes of 1859, prizes were awarded for

"coloured cheese" and "uncoloured cheese." In the Wool section it appears that "Leicester Teg-wool," "Southdown Teg-wool," "Gloucester Teg-wool," and "Shropshire Teg-wool" were the prize exhibits.

The former Show at Warwick was held at a period of the Society's history when competitions of implements for prizes were a great feature of the Country Meetings. In 1859, substantial money prizes of different values were awarded for sixteen distinct kinds of ploughs; for seven kinds of harrows; for six kinds of cultivators, grubbers, or scarifiers; for six kinds of rollers or clod-crushers; in eight cases for appliances for making drains, or drain-pipes and tiles; and for a farm gate. In addition, nine medals were granted in 1859—for a paring plough; a grass-mowing machine; a kitchener; two collections of agricultural plants, seeds, and grain; an atmospheric hammer; a dry clay brick-making machine; a brick-making machine; and a granary. The Implement awards and exhibits generally at the Meeting of this year are the subject of a separate report, by Mr. T. H. Thursfield, also appearing in this number of the Journal; and it will suffice, therefore, to say here that in 1892 prizes were awarded in eight classes of ploughs, and three Silver Medals were given by the Judges—for hand-riddles for potatoes, &c.; a brick- and tile-making machine; and a metal stringer.

The Warwick Meeting of 1859 is noteworthy because the entries, both of implements and of live stock, were in excess of those of any of the score of previous Meetings which up to that date the Society had held. There was, however, contrary to the practice of the preceding six or seven years, no show of poultry in 1859, the Council having decided to abandon that portion of the display. The annual exhibition of poultry was resumed, it may be remembered, at Preston in 1885, since when it has been regularly continued. Another circumstance worth recalling, in connection with the former Warwick Meeting, is that in 1859 the annual custom according to which Members of the Society dined together in a specially erected pavilion was abandoned. For several years previously this dinner had resulted in a loss of something like 500*l.* a year, and the custom was, therefore, departed from upon economic grounds, though it doubtless served a useful purpose in the early years of the Society's existence.

It is interesting to note that at the former Warwick Meeting the duties of adjudication were performed by forty-one Judges, whereas at this year's Meeting the number of Judges was eighty-five, or more than twice as many as sufficed a generation ago.

THE SHOW.

According to custom, the Implement Department was open to the public on the Saturday (June 18), whilst the whole Show-yard was open from the following Monday (June 20) to Friday (June 24). Save for an occasional brief shower—acceptable rather than otherwise—the Meeting was, excepting on one day, marked by pleasant weather and by an absence of excessive heat. The exception referred to was in every way unfortunate, for it was occasioned by an incessant fall of heavy rain on the Thursday, from the early hours of the morning till between 1 and 2 P.M. Thursday being the "popular" day, the effect upon the attendance was disastrous.

On the Sunday, the large tent on the Show-ground was more than filled by the attendance of grooms, herdsmen, shepherds, and others, who assembled to take part in Divine service. The Rev. Thurston Rivington, Vicar of St. Nicholas, Warwick, officiated, and the sermon was preached by the Bishop of Worcester (the Right Rev. J. J. S. Perowne, D.D.), from the text (St. John vi. 27), "Labour not for the meat which perisheth, but for that meat which endureth unto everlasting life, which the Son of Man shall give unto you: for Him hath God the Father sealed."

At 8.30 A.M. on Monday the Honorary Director, Sir Jacob Wilson, addressed the Stewards and the Judges of live stock, briefly explaining the duties they had to perform, and by 9 o'clock these gentlemen had commenced their work in the several judging rings, all of which were well patronised by interested spectators. In fact, despite the intentionally high admission fee of five shillings on the judging day, the number of persons who paid for entrance was very decidedly above the average.

Delightful weather prevailed on the Tuesday, when the usual general meeting of members was held in the large tent, though many who were unable to find room inside helped to swell the large crowd without. The Earl of Feversham, President of the Society, occupied the chair, and His Royal Highness Prince Christian, K.G., and the Duke of Westminster, K.G., President-elect, were amongst the Members of Council upon the platform. A report of this meeting will be found in the Appendix, page xciv. On this and the remaining days of the Meeting, the band of the first battalion of the Royal Warwickshire Regiment played selections of music, the programme of which was printed in the Catalogue.

On Wednesday, the Mayor of Warwick (Mr. Alderman Mann) entertained the Council and Officers of the Royal Agri-

cultural Society at luncheon at the Court House, Warwick. The Mayor proposed the toasts of "The Queen," and "The Prince and Princess of Wales, and the other members of the Royal Family," after which Lord Leigh (Lord-Lieutenant of Warwickshire) proposed "Success to the Royal Agricultural Society." As his Lordship had taken an active part in promoting the success of the Society's former Meeting at Warwick, in 1859, he was able to entertain his hearers with interesting reminiscences and with instructive comparisons. The toast was acknowledged by the Earl of Feversham, who, as the retiring President, spoke in enthusiastic terms of the record of work which the Society had to its credit, and predicted for it a future not less honourable and praiseworthy than its past. The last toast, that of "The Health of the Mayor of Warwick," was proposed in happy terms by His Royal Highness Prince Christian of Schleswig-Holstein. In responding, the Mayor expressed the hope that at no very distant date, the ancient town of Warwick would again have the pleasure of extending a cordial welcome to the Royal Agricultural Society. On the same afternoon, which was beautifully fine, the Mayor and Mayoress of Leamington gave a garden party in honour of the visit of the Society.

After the deplorable loss sustained by the Royal Family and the nation generally at the beginning of the year, it was with no ordinary gratification that agriculturists learnt that His Royal Highness the Prince of Wales, accompanied by his son the Duke of York, had decided to honour the Warwick Meeting with his presence. As a matter of fact, their Royal Highnesses not only paid an early and informal visit to the Show on the Saturday afternoon, but spent several hours upon the ground both on the Monday and on the Tuesday, making a thorough inspection of the live stock classes and of other departments of the exhibition. Both their Royal Highnesses were the guests of the Earl and Countess of Warwick at Warwick Castle, where the house party also included Lord and Lady Brooke, the President of the Royal Agricultural Society (the Earl of Feversham), and the President of the Board of Agriculture (the Right Hon. Henry Chaplin, M.P.).

The only regrettable feature of the Meeting was, as has been intimated, that arising from the gloomy skies and drenching rains of the Thursday, which, as the first of the shilling days, is usually marked by the largest attendance. The number of paying visitors on that day was scarcely two-thirds of the average, nor can it be suggested that the shillings which failed to reach the gates on the Thursday came on the Friday,

although it was as fine a Midsummer Day as could be wished. It is hardly too much to assume that had Thursday's weather been favourable, at least 20,000 more people would have passed the turnstiles, though even that number would have left the total far below the Thursday's record at the last Meeting held in a Midland town (Nottingham, 1888). The total number of paying visitors at Warwick is the lowest recorded since 1885, but it deserves to be noted that on the five-shilling day (Monday), and on the first half-crown day (Tuesday), the number who paid for admission was above the average.

The subjoined Table shows the number of paying visitors at recent Meetings. At Plymouth, there were three one-shilling days and only one half-crown day; whilst, at Windsor, Thursday was a half-crown day.

Day of Show	Warwick, 1892	Doncaster, 1891	Plymouth, 1890	Windsor, 1889	Nottingham, 1888	Newcastle, 1887	Norwich, 1886	Preston. 1885	Shrewsbury, 1884
Implement day.	266	344	194	493	1,826	1,209	148	394	194
1st day (Mon.).	3,570	2,681	1,234	6,223	1,671	1,097	625	3,557	2,183
2nd day (Tues.)	16,598	12,331	10,008	18,809	11,103	11,331	8,074	21,713	11,211
3rd day (Wed.).	15,779	18,530	39,308	24,690	9,057	12,020	10,894	19,318	13,474
4th day (Thurs.)	36,448	57,580	32,371	32,965	88,832	77,410	42,774	34,302	49,374
5th day (Fri.) .	23,801	20,034	14,026	41,493	35,438	24,305	42,394	14,908	17,690
Total . .	96,462	111,500	97,141	155,707[1]	147,927	127,372	104,909	91,192	94,126

[1] Including 28,034 on the sixth day (Saturday).

In the notices of the various Classes of exhibits which follow, the views of the Judges of the respective sections are incorporated, and, where necessary, quotations are given from the Judges' reports. The names of the Stewards and the Judges, with the complete list of Awards, are to be found in the Appendix, page xcix. *et seq.*

Light Horses.

Thoroughbred Stallions.—This class was made up of the three horses which won the three premiums of 200*l.* each offered by the Society, and special Gold Medals provided by the Warwick Local Committee, at the Spring Show, held at the Royal Agricultural Hall, London, March 1 to 4, 1892, for the award of the Queen's Premiums for thoroughbred stallions. They were Mr. E. G. Crowhurst's *Just-in-time*, foaled in 1881, bred by Mr. Thomas Stevens; Lord Tredegar's *Lord Molynoo*, foaled in 1883, bred by Mr. Thomas Jennings; and Mr. J. C. Harford's *Rameses*, foaled in 1885, bred by the Earl of Bradford. During the season of 1892, *Just-in-time* stood at Leamington; *Lord Molynoo* at the Stud Farm, Coedkernew, near Newport, Mon.; and *Rameses*

at Ludlow, Leominster, and Hereford. They were present at the Warwick Show on the Monday, Tuesday, and Wednesday, in compliance with the conditions under which the prizes were offered for competition at the Spring Show in the Society's District F.

Hunters.—Eight classes were allotted to this section, as compared with 11 classes both at Doncaster in 1891 and at Windsor in 1889, and 6 classes at Plymouth in 1890. Two sets of Judges officiated, the one set dealing with Classes 2, 4, 5 and 6, and the other set with Classes 1, 3, 7 and 8.

In Class 1, for hunter mares and foal, there were 16 entries. The Judges selected 6 for the veterinary examination, and 5 of them were passed as sound. These 5 "were all useful mares, and the foals of good quality and substance, particularly the foals of the winners." Lord Willoughby de Broke's *Blue Stocking*, Major Langlands's *Scarlet*, and Mr. John Cooper's *Beatrice* took the first, second, and third prizes respectively.

Class 2, for hunter mares or geldings up to 15 stone, foaled in 1886 or 1887, won the unqualified admiration of the Judges, as the best class of weight-carriers they had ever judged or seen in the Show-ring. The general quality was so good that the whole class was highly commended. The first prize animal, Mr. Henry Ford's 5-year-old bay gelding *Roaster*, proved to be "a very fast, active, powerful horse, beautifully balanced, and with plenty of bone." The same exhibitor took the third prize with *York*, Mr. Joseph Horton's *Tiptop* being second.

Class 3, for hunter mares or geldings up to 12 stone, foaled in 1886 or 1887, was strong in numbers. Many of the most valuable animals were considered by the Judges as up to more weight than stipulated, consequently they were passed by. The three prize winners and the reserve number moved and rode the best, and showed themselves "to be horses of high merit as light-weight hunters." The substantial awards went, in order, to Mr. Henry Custance's *The Knight*, Mr. R. D. Levett's *Laddie*, and Mr. Joseph Horton's *Paragon*.

Class 4, for hunter mares foaled in 1888, was only of moderate quality. The first prize went to Mr. J. H. Stokes for *May Queen*, "a nice active animal, but too small." Mr. A. J. Brown was second with *Miss O'Connell*, and Mr. Gilbert Greenall was third with *Dorothy*.

Class 5, for hunter geldings foaled in 1888, was also of not more than average quality. An exception must, however, be made in the case of *Seakale*, for which Mrs. C. T. Hoare received the first prize. "This horse is by *Soulouque*. He is very fast, active, and quite a first class animal, being nicely balanced, and

very pleasant to ride. If *Soulouque's* stock prove to be of somewhat similar character, he will be a very valuable hunter sire." The second prize went to Mr. J. S. Darrell for *War Eagle*, and the third prize to Mr. J. H. Stokes for *Brown Study*.

Class 6, for hunter geldings foaled in 1889, was of fair average quality. Mr. C. Lee Campbell's *Selim*, Mr. B. F. Drage's *Boaster*, and Mr. Francis Nalder's *General Servant* obtained the solid awards in the order named.

Class 7, for hunter fillies foaled in 1889, put forward a first prize winner in Mr. John Beach's *Clematis*, "an extraordinarily good mare, and, for a thoroughbred, one of wonderful substance." Second and third were Mr. W. Muzeen's *Modesty* and Mr. C. H. Wailes's *Blue Empress*, which, though "both a long way behind the winner," the Judges regarded as useful saleable animals. Mr. Muzeen's *Modesty* was first in the two-year-old filly class at Doncaster last year.

Class 8, for hunter fillies foaled in 1890, was made up of a moderate lot of animals, save for the prize-winners. Mr. Robert J. Mann's first prize filly *Ruby* was "full of quality and action." Mr. John Lett's second prize filly *Queenie* was "strong and of good quality," the same remarks applying to Mr. E. Howard Dawson's third prize *Caramel*, "a very poor and backward filly that will see a better day."

Of the 24 prizes awarded in the Hunter Classes, six went to Warwickshire exhibitors, whilst five went to Yorkshire, two to Leicestershire, and two to Northamptonshire. Nine other counties—Bedford, Chester, Durham, Hereford, Lancaster, Lincoln, Oxford, Rutland, and Salop—secured one prize each. In Class 2 all the prizes were kept in Warwickshire.

Coach Horses.—Two classes were allotted to this section, as compared with seven classes at Doncaster in 1891, and four classes at Plymouth in 1890. "As a rule, where there was size there was a tendency to lack of quality, and the very smart ones were deficient in power."

Class 9, for coaching stallions foaled in 1888, 1889, or 1890, although tolerably strong in numbers, exhibited no extraordinary merit. It is worthy of note, however, that of the seven horses sent for veterinary examination all were passed as sound. With one exception the entries throughout were made from Yorkshire, which county took all the prizes. The first prize went to Mr. Thomas Carr's *Salisbury*, a horse "full of power and quality, with plenty of liberty in his action," which thus improves on his position as third in the two-year-old stallion class at Doncaster in 1891. Mr. F. H. Stericker's *Leamington* was second, and Mr. John White's *Knight of the Vale*

was third. "Among the stallions there was generally a want of true action, and especially of hock action, and in some cases the feet would not bear very close inspection."

Class 10, for coaching mares and foal, was a small one, "and the deficiency in numbers was unfortunately not made good by the exceptional quality of the exhibits, although the first and second prize winners possessed size and quality." These were Mr. Thomas Radcliffe's *Wath Belle*, and Mr. John Kirby's *Lady Mary*, the latter having been first in the three-year-old filly class at Doncaster. The first prize mare was entered from the county of Salop.

Hackneys.—The 47 entries in this section fell far below the 128 entries at Doncaster, though it compared favourably with the 33 entries at Plymouth in 1890.

Class 11, for hackney stallions foaled in 1888, 1889, or 1890, above 15 hands, was "not at all a satisfactory class." The prizes fell, in order, to Messrs. E. and T. Green's *Blaze 2nd*, Mr. Thomas Fulcher's *Benno*, and Mr. George Jackson's *Melbourne.* The first named, shown by another exhibitor, obtained third prize at Doncaster in the three-year-old stallion class.

Class 12, for hackney stallions foaled in 1888, 1889, or 1890, above 14 hands and not exceeding 15 hands, although it furnished the Champion stallion, was, "as a class, inferior in quality." Mr. James Temple was first with *Doncaster*, which took the Gold Medal offered by the Hackney Horse Society for the best hackney stallion. Mr. Garrett Taylor took the second prize for *Hackford Shales*, and Mr. Alfred Lewis the third prize for *Harefoot.* The Judges say, "In awarding the Champion prize for Hackney Stallions we found neither of the animals a very good credit to the breed. The action of *Doncaster*, however, being superior to that of *Blaze 2nd*, we awarded the former the championship." They further express the opinion that if the ages of the stallions had been extended to eight years there would have been better classes.

Class 13, for hackney brood mares and foal, above 15 hands, was "a very good all-round class." The first prize went to Mr. Harry Livesey's *Countess*, "a mare of both beautiful quality and fine action"; she took a second prize at Doncaster in 1891, in the same class. Mr. Henry Moore's second prize mare *Sweetbriar* is "a perfect type of hackney." The third prize went to the Prince of Wales for *New York*, "a very fine showy mare with some good points"; she headed the class at Doncaster. The reserve was found in "a nice level mare" *Rosebud*, also exhibited by His Royal Highness.

Class 14, for hackney brood mares and foal, above 14 hands

and not exceeding 15 hands, produced the Champion hackney mare in Mr. Livesey's *Nelly 3rd*, of which the Judges report that "her action and quality are simply superb," whilst they regard her as "almost the finest brood mare in England;" she took third prize in the corresponding class at Doncaster. The second prize went to Mr. E. T. G. Lindsey's *Pandora*, "a mare with fine action." Mr. Walter Waterhouse took the third prize with *Caprice*, "a mare with plenty of size and quality, and looks more like harness than riding;" she was awarded the reserve card at Doncaster.

Class 15, for hackney mares or geldings above 14 hands, up to 15 stone, foaled in 1886, 1887, or 1888, was topped by the Earl of Londesborough's beautiful mare *Vanity*, which the Judges "would have been glad to find amongst the brood mares;" she took second prize in the three-year-old filly class at Doncaster. The second and third were "both good animals," the former being Mr. Gilbert Greenall's *Paul*, and the latter Mr. Waterhouse's *Cactus*.

Class 16, for hackney mares or geldings, above 14 hands, up to 12 stone, foaled in 1886, 1887, or 1888, was one of the best of the hackney classes. The first prize mare, Mr. William Pope's *Lady Isabella*, "is of the true hackney type, with extraordinary hind action." The second prize was awarded without hesitation to Lady Brooke's *Queen of the Dale*. Mr. Samuel Rose's third prize gelding *Royalty* "is an improving young horse."

Of the 18 prizes awarded in the six Hackney classes, six went to Norfolk exhibitors, three to Kent, two to Sussex, and two to Yorkshire, whilst the counties of Chester, Essex, Montgomery, Warwick, and Worcester, secured one prize each. In addition, the male championship went to Kent, and the female championship to Sussex.

Ponies comprised 46 entries arranged in 4 classes.

Class 17, for pony stallions not exceeding 14 hands, was "not at all a good class." The prizes went to Mr. Joseph Wood for *Winnall George*, Mr. A. W. Clarke for *Portwood Confidence*, and the Prince of Wales for *Wait-a-bit*.

Class 18, for pony brood mares and foal, not exceeding 14 hands, was for the fourth time headed by the veteran mare *Snorer*, "who keeps to her show form wonderfully well." She is now the property of Sir Humphrey F. De Trafford, by whom she was entered. The second prize went to Mr. Henry Moore for *Jinnie Wren*, "a promising young pony, and, with such a choice of sires as her owner possesses, she should become a very valuable brood mare." Mr. Edward Green's third prize *Jessie*

was "a very nice mare, but with shoulders not quite so good as first and second."

Class 19, for pony mares or geldings above 13 hands, and not exceeding 14 hands, sent to the front Mrs. Mather's *Florence*, "a bay mare with fine fore-leg action, but lacking a little in hind-leg action, otherwise she would be an extraordinary animal." Mr. Arthur E. Evans took the second prize with *Gay Jack*, a skewbald, "with hard clean-cut legs, and fair average action."

Class 20, for pony mares or geldings not exceeding 13 hands, contained, in the first prize animal, Mr. William Pope's *Peacock*, "the best of the pony classes." The second prize went to "a very nice animal" in Mr. J. A. Mather's *Apology*.

Harness Horses and Ponies, shown in harness with suitable vehicles, were in two classes.

Class 21, for harness mares or geldings of any age, exceeding 14 hands, was fairly strong as regards numbers, "but they were generally lacking in size, and throughout the class was hardly what might have been expected to have been seen at the Royal." The prizes went to Mr. William Pope's *Nelly* and Mr. J. H. Clifton's *Bay Rhum*.

Class 22, for harness mares or geldings not exceeding 14 hands, was small in numbers, but the prize winners "were well above ordinary merit." Mr. Pope's *Magpie* was first, Messrs. Butcher and Thomas being second with *Valentine*. The latter "appeared to be a very fast pony indeed."

Heavy Horses.

Shires.—Whilst the number fell somewhat short of the display at Doncaster last year, the 129 entries placed the Shires numerically first at Warwick, the Hunters coming next with a total of 124 entries.

Class 23, for Shire stallions foaled in 1889, was a very strong class. The winner and male champion was found in Mr. Joseph Wainwright's *Bury Victor Chief*, which thus repeats his performance at Doncaster last year, when he was exhibited by his breeder, Mr. John Rowell. The Judges regard him as "probably the best three-year-old colt that has been seen for many years. He is looking very fresh and well, and is an easy winner in his class, and of the Champion prize, notwithstanding there being formidable competitors from the other classes." The second prize went to Mr. William Arkwright for *Scarsdale Rocket*, "a lighter horse, showing real Shire character, with good feet and pasterns."

Mr. J. A. Barrs was third with *Nailstone Challenger*, "a horse of good quality, but scarcely so weighty as the first two."

Class 24, for Shire stallions foaled in 1890, was the scene of a close contest between Lord Belper's *Burgundy* and the Earl of Ellesmere's *Duke of Worsley*, "both of excellent quality, the former only winning by having rather more weight." Mr. Barrs again came in third, with a "weighty" and good-coloured horse, *Nailstone Royal Stamp*, "very suitable for getting heavy horses." On the whole, this was a good class.

Class 25, for Shire stallions foaled in 1891, was hardly up to the average. The first prize went to "a weighty colt" exhibited by Mrs. Perry-Herrick, and the second prize to *Picton Marmion*, a colt of nice quality entered by Mr. J. J. Lees. Mr. Thomas Pearson's *Shire's Standard* was third.

Class 26, for Shire mares and foal, was made up of an exceedingly grand lot of mares and foals. The winner was found in the Earl of Ellesmere's *Princess Louisa*, "a real type of Shire with a good foal on her. She also adds to her honours by taking the female Champion prize, with two very strong opponents in the three and two-year-old fillies." Mr. J. P. Cross was second with *Mavourneen*, "a four-year-old, with a very good foal at heel, and looks like making a good brood mare. She is run hard by the third prize, a brown mare of good character, size, and substance," Mr. William Bouch's *Wildflower*. At Doncaster last year *Mavourneen* headed her class.

Class 27, for Shire fillies foaled in 1889, was excellent. The first prize was taken by Mr. Bouch with *Cornflower*, a filly of great weight and substance. Mr. A. B. Freeman-Mitford, C.B., was second with *Minnehaha*, a bay filly "with good action and legs and feet." Mr. P. A. Muntz, M.P., took third prize with *Dunsmore Bracelet*, "a beautiful filly, but not so weighty as the first and second."

Class 28, for Shire fillies foaled in 1890, "was a credit to any breed." The first and second prize mares—Mr. S. B. Chadwick's *Hawthorndale* and Mr. Thomas Hardy's *Mere Duchess*—"will be heard of again, and always difficult to beat." The second prize filly has improved on her position at Doncaster last year, when she got the reserve card in the yearling class. The third prize went to Mr. Muntz for *Gloaming*, "a useful filly of nice character."

Class 29, for Shire fillies foaled in 1891, "was not anything like so good as the preceding classes." The first prize was easily won by Mr. Muntz with *Cui-Bono*. Mr. W. R. Wardle's *Weston Lassie* was second, and Mr. Fred Crisp's *Southgate Black Duchess* was third.

Of the 21 prizes awarded in the seven Shire classes, six were taken by Warwickshire, five by Derbyshire, three by Lancashire, three by Leicestershire, two by Cheshire, and one each by Gloucestershire and Middlesex. In addition, Derbyshire secured the male championship, and Lancashire the female championship.

Clydesdales.—There were only 29 entries of this breed, as against 57 at Doncaster in 1891, and 36 at Plymouth in 1890.

Class 30, for Clydesdale stallions foaled in 1889, produced the winner of the Champion prize, offered by the Clydesdale Horse Society for the best stallion, in *Macquhae*, "a splendid animal, showing an immense amount of Clydesdale character, combined with symmetry and activity." He was exhibited by Her Majesty the Queen, from the Flemish Farm, Windsor, and won a third prize at Doncaster last year, The second prize went to Lords A. and L. Cecil for *Crown of Royalty*, "a horse possessing a great amount of strength and activity, and of good colour;" he got a reserve card last year. The third prize went to a strong useful animal in Sir E. G. Loder's *Duke of Whittlebury*.

Class 31, for Clydesdale stallions foaled in 1890, only contained three animals, all of which were placed. The first prize went to Mr. William Graham's *Sir Harry*, "a very sweet and handsome colt, combining symmetry with activity," and considered by the Judges to be "the best Clydesdale colt showing this season." Mr. William Montgomery's *Meridian*, "a strong, useful, well-coloured colt," was second; and the third prize went to a fair colt in Lords A. and L. Cecil's *Prince Eddy*.

Class 32, for Clydesdale mares and foal, was headed by Mr. W. Graham's *Nelly Milton*, "a mare of good Clydesdale character, but deficient in size." Next to her was placed Viscount Emlyn's *Bell*, "a mare of good colour and symmetry," which also took a second prize at Doncaster in 1891. The third prize fell to Sir E. G. Loder's *Maid of the Mist*, "a strong mare, deficient in quality."

Class 33, for Clydesdale fillies foaled in 1889, attracted but five entries, yet it was one of the best of the classes. The first prize went to Lords A. and L. Cecil's *Carillon*, "a handsome, very superior mare, combining strength, symmetry, and activity." The same exhibitors' *Carissima*, "a mare of good colour, but scarcely of the same substance," was placed second, thus reversing the order of last year's awards at Doncaster, when *Carissima* took the third prize with *Carillon* in reserve. The third prize fell to the Marquis of Londonderry for *Woodbine*, "a very sweet, handsome mare, a little hard on her head, and plain on her back."

Class 34, for Clydesdale fillies foaled in 1890, contained the

female Champion of the Clydesdale classes in Mr. L. Pilkington's *Queen of the Roses*, which the Judges describe as an "extremely handsome mare, full of character, and true to type, good colour, symmetry, and activity; careful mating in this case has improved upon the original." The second prize was awarded to Mr. W. Graham's *Lothian Lass*, "a very fair mare and of good colour;" and the third prize to Lords A. and L. Cecil's *Queen Bess*, "a very compact mare, a little deficient in size," which was highly commended at Doncaster.

Of the 15 prizes awarded in the five classes of Clydesdales, five went to Kent, three to Cumberland, and two to Northamptonshire, whilst the counties of Berks, Carmarthen, Dumfries, Durham, and Kirkcudbright took one each. In addition, Berks secured the male championship, and Dumfries the female championship.

Suffolks.—The experience of the last three years serves to bring out the curious fact that the nearer the Society's Meeting is held to the home of the breed, the less numerously is the Suffolk breed of horses represented. Thus, whilst at Plymouth in 1890 there were 56 entries, there were at Doncaster in 1891 only 41, and this year at Warwick the number fell to 31. With three exceptions the entries at Warwick were all made from the county which gives the breed its name, and all the prizes went to Suffolk. Though the number was smaller, however, the quality showed no falling off, and the Judges report the display as "excellent."

Class 35, for Suffolk stallions foaled in 1889, was occupied by seven very meritorious horses, especially Messrs. I. Pratt and Son's *Eclipse*, which, in taking the first prize, repeated his victory of last year. Mr. Alfred J. Smith was second with *Democrat*, and the Duke of Hamilton and Brandon was third with *Wedgewood 2nd*, which stood a place higher at Doncaster.

Class 36, for Suffolk stallions foaled in 1890, was headed by Messrs. I. Pratt and Son's *Earl*, "a grand horse which, in powers and weight, will hold his own with the larger breeds of horses." Mr. Robert Edgar's *Hardware* was second, and Mr. Horace Wolton's *Chieftain's Champion* was third.

Class 37, for Suffolk mares and foal, put forward only two competitors, of which Mr. Edgar's *Prattle* was selected for the first prize.

Class 38, for Suffolk fillies foaled in 1889, made but three in number, which were all placed, being "perfect representatives of the type of the breed, and especially deserving of notice." The Duke of Hamilton and Brandon's *Queen of Trumps* was first, as was the case at Doncaster. Messrs. W. E. S. and P. H. Wilson's

Darling was second, this being another repetition of a Doncaster success. The third prize went to Mr. Wolton's *Matchett*, which thus improved upon her reserve card at Doncaster.

Class 39, for Suffolk fillies foaled in 1890, so impressed the Judges that they commended the class. Taking them throughout, they were the best lot of two-year-old fillies the Judges had seen for years. Mr. William Byford's *Lady*, Messrs. Wilson's *Matchett*, and Mr. Alfred J. Smith's *Dainty Dolly* obtained the solid awards in the order indicated.

Agricultural Horses.—There were five entries in Class 40, and two in Class 41. Class 40, for agricultural geldings foaled in 1889, got by a stallion registered in the Shire Horse Stud Book, brought forward some useful animals, but, owing to the demand for good stallions, the class was not so strong as the Judges have seen it. The entries came from Lancashire, Yorkshire, Warwickshire, and Berkshire. The first prize went to Mr. Henry Lawson's *Briton*, and the second to Sir Humphrey De Trafford's *Grange*.

Class 41, for agricultural geldings foaled in 1890, got by a stallion registered in the Shire Horse Stud Book, was of no great merit. Mr. Arthur M. Tree took the two prizes.

Veterinary Examination.—This year the veterinary examination of horses, before prizes could be awarded to them by the Judges, was for the first time extended to brood mares as well as to stallions. The results of this examination are recorded in the Appendix, page lxxx.

Cattle.

Shorthorns.—The entries numbered 134, which is about a score in excess of the entries at Doncaster last year. Fourteen were entered from Scotland, from the counties of Aberdeen and Berwick. The rest were exclusively from England, no less than 26 English counties being represented, namely, Berks, Bucks, Cambridge, Cornwall, Cumberland, Essex, Hants, Kent, Lancaster, Lincoln, Middlesex, Monmouth, Norfolk, Northampton, Northumberland, Notts, Oxon, Rutland, Salop, Somerset, Stafford, Warwick, Westmoreland, Wilts, Worcester, and York. Amongst the 28 English and Scottish counties, the 20 prizes awarded were thus distributed: Berks 3, Worcester 3, Berwick 2, Cumberland 2, Wilts 2, York 2, and one each to Monmouth, Norfolk, Northampton, Northumberland, Oxon, and Westmoreland. In addition, the male championship went to Yorkshire and the female championship to Berwickshire.

Aged bulls (Class 42) were a good class of 21 entries, and as the first six were of approximately equal merit, some time was occupied in placing them, and in assigning the substantial awards to Mr. Henry Williams's *Major*, Mr. J. Deane Willis's *Count Lavender*, and Mr. H. T. Cookson's *Judge of Assize.* "One or two bulls in this class were off their feet, probably from over-feeding," otherwise the decisions might have been somewhat different.

In Class 43, bulls calved in 1890, there were 17 entries, amongst which the first prize bull, *Fairfax*, exhibited by Her Majesty the Queen, "stood out prominently from the rest." There were four or five other useful bulls, but many of the rest were hardly of Royal Show merit.

Yearling bulls (Class 44) numbered 30 entries, the first of which, the Duke of Northumberland's *Fairy King*, "showed considerable merit, and was an easy winner." The second and third—the Prince of Wales's *Broughton Lad* and Mr. John Handley's *Captain Ingram*—were nearly equal. "Some of the animals in this class, though good farmers' bulls, had no pretensions to being Showyard cattle."

For the male Shorthorn championship two strong competitors came forward in Mr. Williams's *Major* and the Queen's *Fairfax*. The former was selected, but he was approached very closely in merit by the other.

In a small class (45) of seven Shorthorn cows, the first three were extraordinary animals, the first prize cow, Lord Polwarth's *Truth*, "being one of the most perfect Show cows that has been before the public for many years." The same breeder's second prize cow, *Wave of Loch Leven*, "was one of the same type, and had had twin calves within a fortnight of the Show, which added greatly to her merit; and not only did she show splendid form and beef-producing properties, but she was evidently a good specimen of a dairy cow." The third prize cow, Mr. C. W. Brierley's *Softlaw Rose*, "was of an entirely different type, being of immense substance, but did not show the quality of the first two."

Heifers in-milk or in-calf (Class 46) made "a small, rather weak class." The prize-winners were Mr. Brierley's *Godiva Butterfly*, Mr. Thomas Stokes's *Gladys Waterloo*, and the Queen's *Rachel.* "With the exception of the first two there was nothing beyond ordinary merit."

Heifers, calved in 1890, formed an extraordinarily good class (47) of 25 entries—"one of the best classes ever seen in a Royal Showyard." The prize takers—the Queen's *Rosemary*, Mr. Robert Thompson's *Margaretta Millicent*, and Mr. Edward Ecroyd's *Well Heads Rose 14th*—were of nearly equal merit,

and the Judges believe that three such two-year-olds "have never before been seen together at one time." They add, "A few heifers in this class would perhaps be considered almost too fat for breeding purposes; at the same time we are of opinion that the exhibitors should be allowed to use their own discretion on the point, running the risk of Judges' opinion on it."

Yearling heifers (Class 48) made up 25 entries, "of not more than average merit." Mr. R. Stratton's *Timbrel 23rd* was placed first, and Mr. Brierley's *Rosedale Minerva* won the second prize. "The first prize heifer, though perhaps on the small side, was otherwise exceptionally good."

No difficulty was felt in assigning the female championship to Lord Polwarth's *Truth*, "one of the best Shorthorns that has been exhibited for some years."

Of the Shorthorns as a whole the Judges remark:

> We feel sure we are only doing our duty to the Royal Society, and to the breeders of Shorthorns, when we say that, taken as a whole, it is the best Show of Shorthorns that has been seen for many years. In fact, we believe we are justified in saying that in our opinion it is very doubtful whether a better Show has ever been seen, certainly not in recent years. We are very pleased to see that, judging from the classes of bulls, breeders are determined to consider substance as well as form and quality, and we hope and believe that in a very few years we shall see a considerable further improvement in the animals shown. While admitting the value of pedigree, we are glad to see that form and substance and real merit are receiving consideration worthy of breeders.

Herefords.—The 54 entries of the white-faced breed of cattle compared unfavourably with the numbers at Doncaster and at Plymouth, which is the more surprising in view of their proximity to home at Warwick.

Class 49, for old bulls, brought forward "some magnificent representatives of the breed," as did the next class for two-year-olds. Mr. J. H. Arkwright was first and second with *Spring Jack* and *Rose Cross 2nd*, Mr. W. H. Cooke being third with *Grove Wilton 4th.* The male championship was given to *Spring Jack.* In Class 50, for bulls calved in 1890, Mr. A. E. Hughes was first with *Albion*, Mr. H. W. Taylor was second with *Sainfoin*, and Mr. John Price was third with *Prince of Wales.* Class 51, yearling bulls, were "not of the same merit" as the two preceding classes. The prizes went, in order, to Mr. Rees Keene's *Ruler*, Mr. H. W. Taylor's *Astrakhan*, and the Earl of Coventry's *Gargantua.*

Class 52, for Hereford cows calved before 1889, "was represented by two entries only, and not possessing the same merit as those of many previous Shows;" the prizes went to

Mr. Thomas Fenn and Mr. Frederick Platt. Class 53, for Hereford heifers calved in 1889, was topped by the Earl of Coventry's *Golden Fleece*, Mr. Fenn taking the other prizes with *Downton Hermia* and *Fine Lady.* Class 54, for heifers calved in 1890, furnished the female Hereford Champion in Mr. Richard Green's *Perilla.* Colonel Bridgford's *Sibyl* was second, and Mr. N. F. Moore's *Lady Rufus* was third. Class 55, for yearling heifers, contained the largest entry, "and many of the animals were of superior merit." Mr. Ralph Palmer's *Whiskey* took the first prize, and Mr. John Cave's *New Year's Gift* was second.

Whilst Herefordshire contributed by far the largest number of the exhibits, entries of Hereford cattle were also made from the counties of Berks, Brecknock, Carmarthen, Essex, Gloucester, Monmouth, Notts, Salop, and Worcester. Of the 19 prizes awarded in the seven Hereford classes, ten went to Herefordshire, three to Worcestershire, three to Salop, and one each to Essex, Monmouth, and Notts. Both the Champion awards were won by Herefordshire herds.

Devons.—Of the West Country breed of cattle there were 22 entries, as against 20 at Doncaster and 52 at Plymouth. The awards were more widely distributed than is sometimes the case, the twelve prizes being divided amongst seven successful exhibitors, and going seven of them to Devon, two to Cornwall, two to Somerset, and one to Warwickshire.

Class 56, for aged bulls, was of uniformly high merit. The first prize was won by Sir William Williams with *Pretty Middling*, a bull "especially level, and showing high-class breeding, but not having quite the masculine appearance desirable in a sire." Mr. John Howse's second prize *Lord Stamborough* "was a smart level bull not too good to follow." Mr. W. Lethbridge's third prize *Bravo Tempter 2nd* "was well fleshed, but somewhat hard to touch." Class 57, two-year-old bulls, was rather variable in type. The premier award went to Mr. John F. R. Morris for *Country Gentleman*, "a bull of great size, with good quality, and bold commanding carriage." Mr. J. C. Williams was second with *Doncaster.* Class 58, yearling bulls, was occupied by four useful youngsters, at the head of which was placed Mr. F. J. Coleridge Boles's *Dragoman*, "a very smart level young bull with beautiful flesh evenly laid on, but with somewhat objectionable horns." Mr. J. C. Williams was again second.

Class 59, for cows, had but two occupants, of which the Judges selected *Fiction 2nd*, "a well-fleshed level heifer," shown by Sir William Williams. Class 60, two-year-old heifers, furnished nothing extraordinary. Mr. Howse was first with *Prolific*

13*th*, "a level heifer with not a good head." The second prize heifer "showed better form at a distance, but with many faults at close quarters." Class 61, yearling heifers, had an easy winner in Mr. E. Mucklow's *Lady Ida*, "a well-grown heifer of great promise."

Sussex.—The 29 entries of this breed showed a slight decrease as compared with the numbers at the two preceding Shows. All came from Sussex, Kent, or Surrey, whilst of the twelve prizes awarded in the six classes, Surrey took seven, Kent three, and Sussex two.

Class 62, aged bulls, furnished a winner in Mr. W. Stewart Forster's *Gondolier*, "a bull of great substance, with quality." Mr. C. T. Lucas was a good second with *Lord Oxeye*. Class 63, two-year-old bulls, was headed by Mr. Joseph Godman's *Goldlink*, "a bull of great size and merit," Mr. Forster's second prize *Dogrose* being "a very useful animal." Class 64, yearling bulls, was good throughout, Mr. J. Stewart Hodgson's *Headley* being first, and the Earl of Derby's *Gladiator* second.

Class 65, for cows, put forward a winner in the Earl of Derby's *Brawny*, a cow "of nice quality, with good back, ribs, and depth of carcass." Mr. Hodgson's *Pride of the Family* 11*th* was "very compact, with good back." Class 66, two-year-old heifers, yielded a couple of prizes to Mr. Godman, his *Comely* 19*th* being "of great weight and substance, perhaps a little too fat," and his *Comely* 21*st* "straight and level." Class 67, yearling heifers, was topped by Mr. Forster's *Foxglove*, "a very neat and promising heifer." Mr. Lucas's *Breeze* "is of good quality, but has not quite so much substance as the first."

Longhorns.—Few in numbers, and of no particular quality, is all that can be said of the appearance at Warwick of the old historic breed which Bakewell handled with so much skill, but the star of which has now for many years been on the wane. Two classes (68 and 69) were provided, and Mr. J. T. Oxley secured the prize in each.

Welsh.—The 28 entries of this breed made a much better display than the 10 entries at Doncaster, or the still smaller number at Plymouth. Seven herds were represented. Classes 70 and 71, for bulls, were decidedly good; the prizes in the former went to Lord Harlech and Colonel Henry Platt, and in the latter to Mr. John Jones and Mr. R. M. Greaves. Class 72, for cows, was "a little disappointing." As the animal to which the Judges gave the first prize was not able to comply with the conditions as to calving, the premier award fell eventually to Sir Henry Wiggin's *Martha*. Heifers in Classes 73 and 74

were better; for these, Colonel Platt took two firsts and Lord Harlech two seconds.

Red Polled.—The cattle of East Anglia were twice as numerously represented as at Doncaster last year, but the Judges express their regret that the bull classes were not stronger.

In Class 75, for old bulls, the two best animals were of such different types that the decision of the umpire was called for, with the result that the first place was assigned to Lord Hastings's *Broadbent*, "a very compact, thickset animal, perhaps somewhat on the small scale," but which was afterwards selected as the Champion Red Poll. Mr. W. A. Tyssen-Amherst, M.P., was second with *Red Shirt*. In Class 76, two-year-old bulls, Mr. Amherst's *Didlington Davyson 5th*, a long upstanding animal, was placed first on his Show merits, although the Judges anticipate that another season the second—Mr. Colman's *Jupiter*—will probably turn the tables. Class 77, yearling bulls, was not strong, but the first prize animal, *Red Prince*, has some merit. Both prizes were taken by Mr. J. J. Colman, M.P.

Class 78, for cows, "was probably the strongest, and included some good animals, the usual difficulty as to flesh and milk causing some trouble, more particularly when the Norfolk and Suffolk types came in. The prize rosettes went ultimately to those animals combining as far as possible the two qualifications." The first prize went to Mr. H. P. Green's *Gleam 3rd*, which was reserved for the championship. Mr. Amherst was second, and Mr. A. G. Lucas was third. Class 79, two-year-old heifers, was almost as strong as the preceding. Mr. Colman's first prize heifer *Dorena* stood, however, well in front. Lord Hastings was second, and the Duke of Hamilton and Brandon was third. Class 80, yearling heifers, was weak in entries; the prizes went to Mr. Colman and Mr. Lucas.

Jerseys.—The 168 entries of this favourite breed fell somewhat short of the number at Doncaster. The wide distribution of the breed is shown in the fact that entries were made from the following 22 counties:—Berks, Bucks, Cambridge, Chester, Derby, Dorset, Essex, Hants, Herts, Lancaster, Leicester, Lincoln, Norfolk, Notts, Rutland, Somerset, Suffolk, Surrey, Sussex, Warwick, Worcester, and York. Entries were also made direct from Jersey. The 16 prizes which were awarded were absorbed by eight counties, thus:—Essex 3, Herts 3, Chester 2, Dorset 2, Surrey 2, York 2, Derby 1, Sussex 1. Ten of the prizes went to animals bred in Jersey.

Class 81, for bulls calved in 1888, 1889, or 1890, sent 21 animals into the ring, some of them very excellent specimens.

Mr. James Blyth's first prize bull, *Distinction's Pride*, "is very level, exceptionally good in the horn, and of high quality." The Earl of Londesborough's second prize bull, *Grouville's Dairyman*, "also denotes much quality." The third prize went to Mr. Blyth for *Silver Sea*, "a very symmetrical animal which might have obtained a higher place had he shown a richer horn and more quality." Nine other bulls were noticed in this class.

Class 82, bulls calved in 1891, furnished 27 competitors. The first prize went to Lord Rothschild's *Spots Lad*, "with a good forehand, a specially good neck, and level back; his barrel is somewhat flat, but otherwise this animal is remarkably good." The second prize bull, Mr. H. J. Cornish's *Bismarck*, "shows good quality and other good points, but he does not stand quite as well as he should." In this class again nine commendations were awarded.

Class 83, cows in-milk, calved previously to or in 1888, was excellent. Of the 25 cows which came forward, Lord Rothschild's *Pontorson* was placed first, a cow "noticeable specially for great fineness and quality, an elegant appearance, and an excellent udder." Mr. R. J. Pope's second prize animal, *Carillon*, "is a small but well-framed cow, with a capacious and well-formed udder; her head is a trifle heavy." Mr. George Simpson's third prize *Rosy 3rd* "is an excellent animal of good quality." The general high character of this class led the Judges to give 10 high commendations, and to commend four other animals.

Class 84, cows in-milk, calved in 1889, had 14 competitors. Mr. Gilbert Greenall easily won the first prize with *Miranda*, a cow shown in great perfection, and "probably the best in the female classes in the whole section of Jerseys." It was only after much consideration that Mr. William Arkwright's *Scarsdale Bistre* was placed second; "she is the type of a good milker, with an excellent forehand, but somewhat ill-shaped at the setting of the tail." Mr. Cornish's *Deodora*, a fine and well-bred cow, was third. Four high commendations, and a like number of commendations, were added to the money awards in this class.

Class 85, heifers in-milk or in-calf, calved in 1890, was occupied by 31 animals. A good heifer, Mr. Greenall's *Daisy of the Valley*, went to the front. The second prize was awarded to Lord H. F. H. Pelham-Clinton-Hope, for "a large heifer, with good rump and fine horns." The Earl of Londesborough took the third prize with *Happy Girl*, a heifer with much quality. In addition, 13 commended cards were distributed.

Class 86, heifers calved in 1891, was a large class. The first prize animal having been disqualified by the Council after the

Show, Mr. Salisbury Baxendale's *Tamarisk*, "a promising animal," took first place, and Mr. James Blyth's grey *Alpha* succeeded to the second prize. Four high commendations, and six commendations, completed the awards.

The Judges of Jerseys make the following observations:

It is remarkable that whilst the old breed of Jersey cattle was formerly of mixed colours, and that a self-coloured animal was rarely seen, Fashion has been working a considerable change in this respect. Breeders, in general, in consequence of the unaccountable tastes of buyers, have given up keeping parti-coloured bull-calves and rear up only the self-coloured ones, with the accompanying fancies, black tongue and switch. How far these fanciful ideas go towards improving the dairy qualities of the breed may well be asked, and as easily answered. It is a great mistake to destroy a bull-calf simply because he happens to have white about him. Some 40 years ago, the very best Jersey bulls were of mixed colours, and were not then considered the less beautiful on that account; but now, however rich, good, well-shaped, and profitable a bull may prove himself to be, if he has any white about him he is, by the great majority of breeders, discarded, and frequently through this a valuable strain of dairy stock is lost.

Guernseys.—The catalogue contained 45 entries, as compared with 51 at Doncaster, and 72 at Plymouth. Of the entries Middlesex accounted for 14, Sussex 14, Hants 7, Wilts 6, and Herts 4. Of the 13 prizes, five were awarded to animals bred in Guernsey. Taking the section in its entirety, the Guernseys shown at Warwick "were certainly above average merit, and well deserving the support given to the breed by the Royal Agricultural Society."

Class 87, old bulls, was easily topped by Colonel H. W. Shakerley's island-bred *Paradox*, "one of the finest specimens of the breed ever shown in this country, of great size, perfect in skin, and exceedingly rich in quality." Sir H. A. J. D. Tichborne was second, and Sir F. A. Montefiore was third. Class 88, yearling bulls, put forward a winner in *Finchley Beau*, a young bull "rich in colour and of fair size," shown by Mr. H. C. Stephens, M.P. The Express Dairy Company was second with *Queen's Champion.*

In Class 89, cows in-milk, Sir F. A. Montefiore was first with *Marguerite des Fauxcennaires*, an island-bred cow of great merit, "rich in quality, and having good skin and horns." Mr. Julian Stephens took the second prize with *Alba.* Class 90, two-year-old heifers, brought to the front an imported heifer, Messrs. Fowler and De la Perrelle's *Linda of the Poidevins.* Sir F. A. Montefiore was second with a very beautiful heifer, *Queen of the Isles 3rd*, sister to the first prize heifer in the succeeding class. Mr. George Long's *Norah 7th* was third. Class 91, yearling heifers, was headed by Sir F. A. Montefiore's *Queen of the Isles 4th*, an animal of exceptional merit. Mr. Long took the second prize with *Evelyn.*

Kerry and Dexter Kerry.—These breeds were represented by aggregate numbers practically identical with those at Doncaster last year. Of the 56 entries of the Irish breeds at Warwick, Oxon sent 18, Warwickshire 11, Bucks 7, Surrey 5, Hants 4, Somerset 3, Middlesex 2, Rutland 2, Wilts 2, Cambs 1, and Notts 1.

The four first prizes (Classes 92 to 95) were awarded to Mr. Martin J. Sutton, for the Kerry bull *Kidmore Colorado 2nd*, the Kerry cow *Peep*, the Dexter bull *Kidmore Paradox*, and the Dexter cow *Red Rose*. The same exhibitor took a second prize with the Dexter bull *Red Prince*. Second prizes also went to the Marquis of Lansdowne for the Kerry bull *Shanboe*, to the Express Dairy Company for the Kerry cow *Lady Clara*, and to Mr. Harold Swithinbank for the Dexter cow *Denham Lady Lisburn*.

The Judge in this section reports as follows:—

Both Kerry and Dexter Kerry cattle show increasing improvement. There is greater evenness of type—the mongrels, which in the early days disfigured these classes, are now entirely absent. I notice, however, that the Kerrys are "*thickening*," showing that the tendency is towards the Dexter. This may not be wise on the part of the Kerry breeders if they desire to maintain the distinction of the breed. As dairy animals, some most excellent examples were shown. The three first animals in the Dexters (Class 95) were grand dairy cows, clearly proving the value of this variety, and their claim to be that most useful animal, milk and beef producer combined. The breeders of Kerrys and Dexters can hardly claim more classes for these animals, and hence it is difficult to do all-round justice where almost calves have to compete against mature animals.

Dairy Cattle Milking Trials.

For the nine prizes offered in the three classes 96, 97A, and 97B, into which the Dairy Cattle were divided, 15 cows were entered, and 14 of these came up for the competition. In every case the conditions were—that the milk yielded should contain (on the average of two milkings) not less than 12 per cent. of solids and 3 per cent. of butter-fat, as ascertained by chemical analysis. The prizes were to be awarded to the cows in each class which gave the greatest quantity of milk of the required quality.

A new feature, reports Dr. Voelcker, was introduced this year by making a separate class (Class 96) for cows which had calved not less than three months before the date of the Show. For this class four cows, belonging to two different owners, were entered. The cows in Class 97, in which there was no restriction as to date of calving, were put in two divisions, according as their live weights, taken after milking on the morning

of June 20, came above or below 1,100 lb. Ten cows took part in this competition. The cows were milked dry on the morning of June 20, their live weights were then taken, as registered by a cattle-weighing machine of Messrs. Avery, and they were subdivided into their respective classes, when it was found that six cows belonged to Class 97A and four cows to Class 97B. The awards were made upon the results obtained by the weighing of the milk yielded on the evening (5 P.M.) of June 20 and the morning (7 A.M.) of June 21, samples of the milk being on each occasion taken for analysis and examined at the Society's Laboratory. The results obtained are given in the Table on page 505.

In Class 96 the milk from every cow came up to the requisite richness, and slightly the largest yield was given by No. 1037, Mr. Salisbury Baxendale's *Buttercup*, a Shorthorn cow about eight years old, next to her being the same owner's *Rose* (No. 1038), also a Shorthorn, but three years younger. It may be mentioned that at home these two were considered about equal. Their food was principally linseed-cake, bean-meal, bran and chaff, and cake only when out at grass. They only go "dry" for about three weeks or a month in a year. The third prize was awarded to No. 1040, Mr. George Church's *Beauty*, a dark red Shorthorn. This cow only gives milk from three of the four quarters of the udder, but has taken a milking prize at the Dairy Show, and only goes dry for about three weeks. The yield of the fourth animal, *Number One*, a red and white Shorthorn, also belonging to Mr. Church, was considerably less. This animal took a second prize at the Windsor Show in 1889. The food Mr. Church gives his animals is usually linseed-cake, undecorticated cotton-cake, bean-meal, barley-meal, and brewers' grains (wet).

In Class 97A there was one disqualification on account of deficiency of quality of milk. This was No. 1046, Mr. James Brammer's *Dairyman's Pride*, a cross-bred Shorthorn cow which at Doncaster last year took the first prize, and gave the large yield, in two milkings, of 72 lb. 8 oz. This year she gave even more, the total yield being 74 lb. at the two milkings, which constitutes a "record" at these Shows; but, whilst last year the milk just came within the limits allowed for quality, this year it was too poor, and the cow had to suffer disqualification. She showed enormous milk-veins, but the udder looked like that of a cow very heavily milked. The first prize was awarded to No. 1052, *Dowager*, a roan Shorthorn belonging to Mr. C. A. Pratt, and a very pretty cow, which had only been shown once previously, then taking the milking prize at Chester in September 1891. The food given was linseed-cake and

CLASSES 96 & 97.—COWS IN-MILK, OF ANY BREED OR CROSS, GIVING THE GREATEST QUANTITY OF MILK, CONTAINING NOT LESS THAN 12 PER CENT. SOLIDS AND 3 PER CENT. BUTTER FAT.

No. in Catalogue	Name of Exhibitor	Name of Cow	Breed of Cow	Live weight	Yield of milk in lb. Monday evening	Yield of milk in lb. Tuesday morning	Total yield	Results of analysis: Monday evening's milk, Fat	Monday evening's milk, Solids	Tuesday morning's milk, Fat	Tuesday morning's milk, Solids	Award
	CLASS 96 (*Cows which had calved not less than 3 months before date of Show*)			lb.	lb. oz.	lb. oz.	lb. oz.	per cent.	per cent.	per cent.	per cent.	
1037	S. Baxendale . . .	*Buttercup*	Shorthorn	1260	19 10	25 2	44 12	4·20	13·10	3·38	12·28	1st prize
1038	S. Baxendale . . .	*Rose*	Shorthorn	1442	19 10	24 12	44 6	3·96	12·66	3·47	12·44	2nd prize
1039	George Church . .	*Beauty*	Shorthorn	1267	12 8	16 8	29 0	3·80	12·76	3·82	12·72	—
1040	George Church . .	*Number One*	Shorthorn	1267	17 6	23 4	40 10	3·87	12·27	2·91	11·75	3rd prize
	CLASS 97A (*Cows of or over* 1,100 *lb. live weight*)											
1042	S. Baxendale . . .	*Ethel*	Shorthorn	1470	18 8	22 4	40 12	4·56	13·86	3·63	13·03	2nd prize
1044	S. Baxendale . . .	*Snowdrop*	Shorthorn	1120	16 10	18 14	35 8	3·80	12·44	3·47	12·37	—
1046	James Brammer . .	*Dairyman's Pride*	Shorthorn Cross	1169	32 14	41 2	74 0	3·68	12·08	2·32	10·62	Below standard
1050	George Church . .	*Nancy*	Shorthorn	1337	17 8	21 12	39 4	4·24	12·84	2·97	11·57	3rd prize
1051	J. Gowling & Sons . .	*Queen Pride 1st*	Shorthorn	1253	17 6	21 0	38 6	4·79	13·59	3·18	12·08	—
1052	C. A. Pratt . . .	*Dowager*	Shorthorn	1267	20 6	21 12	42 2	5·42	14·22	2·73	11·93	1st prize
	CLASS 97B (*Cows under* 1,100 *lb. live weight*)											
1041	C. R. W. Adeane . .	*Babraham Belle*	Kerry	889	20 12	30 12	51 8	4·33	13·33	3·67	12·67	1st prize
1047	Joseph Brutton . .	*Fairy Elf*	Jersey	826	15 0	18 12	33 12	6·07	15·17	4·39	13·79	—
1048	George Church . .	*Fancy*	Shorthorn and Red PolledCross	1057	17 14	21 2	39 0	3·75	12·15	3·09	11·89	3rd prize
1049	George Church . .	*Flower*	Red Polled	1092	18 10	24 4	42 14	3·95	12·30	3·57	11·77	2nd prize

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decorticated cotton-cake mixed, about 4 lb. a day, with sharps, but cake only when out at grass. She was stated to give regularly about 15 lb. of butter a week. The second prize went to No. 1042, *Ethel*, a Shorthorn belonging to Mr. Salisbury Baxendale, and the third prize to No. 1050, *Nancy*, a Shorthorn, which won for Mr. Church a second prize at Doncaster last year.

Class 97B contained the most remarkable cow of all exhibited, viz. a Kerry cow, which, while being the lightest cow but one, and weighing only 889 lb., gave no less than 51 lb. 8 oz. of milk in the two milkings, and this of excellent quality. The amount of milk was, with the exception of No. 1046 (disqualified for deficiency of quality), more than produced by any other animal in the three classes, and accordingly this cow would have easily won the first prize from all the cows entered in the Dairy Classes—a really remarkable performance. This animal was No. 1041, *Babraham Belle*, the property of Mr. C. R. W. Adeane, and had been bought at the Dairy Show in 1889, as a heifer, from Mr. James Robertson, of Malahide, Dublin. This was her first appearance in a milking contest, though a calf of hers had taken second prize as a Kerry at the Smithfield Show. The yield of milk is measured daily, and 52 lb. is what the cow is reckoned to give at home in the two milkings, this being very near to the figures now obtained. The cow is generally kept only on grass, but for show purposes is, of course, well fed, linseed-cake, crushed oats, and split beans being the principal foods employed. The second prize cow was No. 1049, a Red Polled cow of Mr. Church's, which won a milking prize at the Dairy Show of 1890. The third prize-winner, No. 1048, belonged to the same owner, and is a daughter of No. 1049.

Sheep.

Leicesters.—These were present in the same strength as at Doncaster, but in less numbers than at distant Plymouth in 1890. The Judges did not consider the display at Warwick equal to the exhibitions of former years. Mr. T. H. Hutchinson's first prize two-shear ram "is a good sheep, and a fair specimen of the breed." Shearling rams were "only a poor class, with the exception of the first prize sheep"—Mr. E. F. Jordan's—"which is of exceptional merit." The lambs were "backward in condition," and the shearling ewes "not so good a class as usual."

Cotswolds.—The catalogue enumerated 27 pens, which was slightly greater than the Doncaster entry. The display was "fairly representative of the breed." Mr. Robert Garne was the

most successful of the five exhibitors, as he took three first prizes. The ram lambs were a strong good class, and the best individual lamb was found in the second prize pen, which, however, was not well matched. Amongst the shearling ewes, "the first prize pen was not so big as the second prize pen, but more matchy, and of very good quality." All the ram lambs and ewes were found worthy of commendation.

Lincolns.—Thirty-seven pens, representing nine flocks, were entered. At Doncaster there were nearly five dozen pens. Of two-shear rams Mr. Robert Wright's first prize sheep "had very good form, but was deficient in size." The shearling rams made up a fairly representative class, the first and second prize sheep—Mr. Henry Dudding's—being "exceptionally fine specimens of the Lincoln breed." In a creditable class of ram lambs the first prize pen of Mr. John Pears was "wonderfully strong and well-grown." The ewes made decidedly the best class of the Lincolns, some of them having seldom been equalled. The prizes went to Mr. Dudding and Mr. Wright, but the whole class was commended.

Oxford Downs.—From a numerical point of view this breed made a fair display of 45 pens, though, considering the locality, a larger entry might have been expected. In the two-shear ram class the first prize went to Mr. John C. Eady for "a useful strong sheep with colour, length, and bone," though hardly so close in the wool as might have been wished. Messrs. Charles Hobbs and Son's second prize ram "owed his position to quality of mutton and wool." In the shearling ram class the three prizes all went to Mr. Albert Brassey for good specimens of the breed; "their colour and bone indicated lean meat, which Judges are bound to keep particularly in view now." In the pens of ram lambs the prizes again went to the Heythrop flock. In the ewe class Mr. Eady's pen came to the front, "sheep of good type, colour, and wool." The second prize pen of Mr. Brassey, and the third prize pen of Mr. George Adams, both contained animals of nice colour and quality. The champion prize for the best animal in the two-shear ram and shearling ram classes went to Mr. Eady's two-shear.

Shropshires.—It was felt at Doncaster, in 1891, that the Shropshire breeders had made a phenomenal display with 182 pens, equivalent to 28 per cent. of the entire entry of sheep. Their effort at Warwick, however, far eclipsed that of the preceding year, for they entered no less than 238 pens, representing 40 per cent. of the entire number of sheep exhibited. The entries of Shropshire sheep on this occasion were made from forty-nine flocks, thus distributed:—Warwickshire 15, Salop 13, Stafford-

shire 10, Herefordshire 2, Leicestershire 2, and the counties of Cambridge, Denbigh, Gloucester, Lancaster, Meath, Nottingham, and Worcester one each. Two sets of Judges officiated, the one set taking the rams, and the other set dealing with the ram lambs and ewes.

The two-shear rams (Class 114, of 42 entries) were a fairly good class, but not so good as the Judges had seen on some previous occasions. Mr. A. E. Mansell's first prize ram is "a very good animal of true Shropshire type, heavy flesh, and good wool, but a little throaty." The same breeder's second prize ram "has nice character, good leg of mutton, and good coat and skin." Amongst the entries selected for commendation were "some massive animals, with a fair amount of quality, true in type, and with skins and coats of the right sort."

Of the shearling rams (Class 115, of 106 entries) the Judges say, "Upon the whole this is an extraordinary class, and possesses more good animals than we have seen for years; at the same time there is no animal that stands out very far superior to the rest." The first prize was won by Mr. W. F. Inge with "a sheep of true type, beautiful form and colour, full of lean flesh, with excellent skin and coat, well sprung, and deep in the ribs, and with his legs well set on; his neck appears a trifle light, but carries a great amount of muscle." Mr. George Graham's second prize ram is "a sheep of beautiful form and carriage, wide and low, with good underline, stands with his legs well outside him; his wool is of fine quality, but might be a little thicker set, and his colour might be a little darker, yet, at the same time, he well earns his position." Mrs. Maria Barrs was awarded the third prize for "a most striking sheep of beautiful type, his legs well placed, and with a good skin. He does not handle quite right, and his leg of mutton might be better, yet he may be considered a most impressive sire." Numbers 1254, 1314, 1298, 1339, and 1255 "are remarkably good sheep, and well worthy of the highest honours." The Champion prize for the best Shropshire ram was awarded to Mr. Inge's shearling.

Ram lambs made up a strong class, but although it contained many lambs of individual merit the pens were not well matched. Mr. William Kirkham's first prize lot "were the best matched pen, but were rather weak in their coats, and not so forward in condition as some others." Mr. Arthur Bradburne's second prize pen "were big strong lambs, but rather lacking in quality."

In Class 117 the Judges had to deal with one of the strongest classes of shearling ewes ever exhibited, and containing many

pens of great merit. The first prize went to Mrs. Barrs for "a pen of splendid ewes, of nice colour and well matched heads, nearly their only fault being a little coarseness in the wool." Mr. George Graham was second with "a fine pen of beautiful quality, but one ewe was rather deficient in her head." Mr. Inge's third prize and reserve pens "were ewes of nice quality on rather a smaller scale." Several of the highly commended pens well deserved, in the opinion of the Judges, more substantial awards.

Class 118, for pens of five Shropshire ewes, which had suckled lambs up to June 15, was a very good display throughout, and the Judges noticed all the pens. Mr. T. S. Minton's first prize pen "were excellent in size and quality, showing most careful breeding." Mr. George Lewis was second with a pen which "were very good on an even larger scale, but not quite the quality of the winners."

Class 119, for pens of five Shropshire ewe lambs, furnished many promising young animals, but some of them in rather low condition. The first prize pen of Messrs. T. and S. Bradburne and the second prize pen of Mr. George Thompson contained very good lambs which the Judges had some difficulty in placing, "as both were of beautiful quality," but Messrs. Bradburne's were the stronger lambs.

Southdowns.—The large entry of 104 pens placed the Southdowns next to the Shropshires in point of numbers. At Doncaster 81 pens were entered, and at Plymouth 75. The Warwick contingent represented 19 flocks in the following counties:—Sussex 6, Cambridge 2, Norfolk 2, Surrey 2, and Berks, Essex, Gloucester, Kent, Nottingham, Suffolk, and Warwick one each. The display was above the average, the classes were well filled, and each class contained sheep of superior type and quality.

Two-shear rams made up a strong class of exceptional merit. The Duke of Richmond and Gordon was first with "a sheep of unusually good style, his type and quality being remarkable." He was "followed by many good animals," the second prize going to Mr. Edwin Ellis. In a strong class of shearling rams the first prize was awarded to Mr. Colman, M.P., for "a sheep of excellent style and quality." The Duke of Hamilton and Brandon's second prize sheep was "also an animal of very great merit." The Judges remark of the shearling rams, "This class is not so universally good as the class of old sheep, and we deem it advisable to remark on two or three good sheep we passed over in consequence of a most objectionable tendency to slugs." The ram lambs were not a specially strong class, and Mr. William Toop's first prize pen was easily placed. Shearling

ewes were a remarkably good lot, and after awarding the prizes to Mr. Colman, Mr. A. de Murrieta, and Mr. James Blyth, the Judges noticed seven other pens.

Hampshire Downs.—The breeders of the West Country black faces did not "rise to the occasion," for with a much nearer place of meeting at Warwick they made rather a less aggregate entry than at Doncaster. The 48 pens in the Warwick catalogue represented 14 flocks. Of the latter, 4 belong to Wilts, 4 to Hants, 2 to Berks, and one each to Cambridge, Dorset, Herts, and Oxon. The nine prizes awarded went, three to Wilts, and two each to Berks, Cambridge, and Hants.

Two-shear rams did not make as strong a class as usual, "though the winners were good specimens of the breed, showing excellent quality." Mr. Henry Lambert took the first prize and Mr. Robert Coles the second. Shearling rams were a much more formidable class, the first prize ram—Mr. Lambert's—"showing fine quality and style." The second and third prize rams of Mr. Frank R. Moore and Mr. Le Roy Lewis were useful sheep. The ram lamb class was the best of the Hampshires, and Mr. William Newton won the first prize easily "with a pen of rare merit." The contest between Mr. Moore and Mr. Lambert for the second place was very keen, the former securing the award. The ewes were a meritorious lot; Mr. Le Roy Lewis took the first prize, and Mr. Newton the second.

Suffolks.—Only 18 pens came forward, this being but two-thirds of the number at Doncaster and at Plymouth. The Warwick entry represented 4 flocks, 3 in Suffolk and 1 in Cambridgeshire. The shearling ewes were a remarkably strong class, in which Mr. Henry Lingwood took the first and third prizes, and the Marquis of Bristol the second. Regarding the display of Suffolk sheep as a whole, the Judges say:—

> We are very pleased to notice that the improvement in this kind of sheep is very marked at this exhibition, showing the result of careful breeding. In most pens the symmetrical appearance is obtained without excessive fat, and we notice that the legs of mutton, which, to critical eyes, may have been their weak point, are now so full of flesh, that they compare favourably with any other breed.

Border Leicesters.—Twenty-one pens were entered at Warwick, and the number cannot be regarded as comparing unfavourably with 30 pens at the more northerly meeting-place at Doncaster. The entries came from half a dozen flocks—two in Northumberland, and one each in Cumberland, Yorkshire, Haddington, and Midlothian. The Judges report "a very good show." For rams, Mr. Thomas Winter was first for "a sheep with excellent skin, with good head and quality, and standing

well on his legs." The shearling rams included a number of excellent sheep, and the first prize went to "a very handsome sheep of extra good quality, with a beautiful head and fine bone," exhibited by the Right Hon. A. J. Balfour, M.P., who also took the second prize. Ewes were a class small in numbers but of good quality, especially Mr. Balfour's pen, to which the first prize was awarded.

Clun Forest.—Prize money to the amount of 30*l.* was offered to induce breeders of Clun Forest sheep in the adjacent county of Shropshire to face one another in the Show ring at Warwick. They omitted to avail themselves of the opportunity thus afforded of making their sheep more widely known. The Judges say, "No entry, which we regret, as this breed is generally approved of, and does well in most districts, being hardy, and making convenient weights as well as good fat lambs."

Welsh Mountain.—Ten entries were made from three flocks, in the counties of Brecon, Carnarvon, and Merioneth. The first prize went for rams to Mr. John Jones, and for ewes to Mr. Godfrey Parry. The Welsh sheep generally were "a very good lot," but the Judges suggest that in future all should be shorn after April 1 in the current year, "as showing them, some shorn and some not shorn, gives considerable additional difficulty in making the awards."

Goats.

The Judges of Goats have sent in the subjoined report :—

The entries for goats were very few, but the quality left nothing to be desired, as it would be difficult to find 14 equal animals in England. In male kids, the Baroness Burdett-Coutts's *Garnet* took first and Champion medal; he is probably the best goat, in all points, yet bred. He was, however, hard pressed by a much younger animal, shown by Sir Humphrey De Trafford. In female goats, Lady Burdett-Coutts took first and Champion medal with *Myrtle*, and second with *Cornflower*, both splendid animals, third going to a very nice animal shown by Mr. Smith-Ryland. The Reserve and H. C. went to a very fine example of the Swiss Schwartzhals, shown by Mr. Paul Thomas, whilst a good specimen of an Angora goat was exhibited by Mr. F. T. Stanley. For the goats under two years, and male kids under a year, Baroness Burdett-Coutts had a walk over, but the animals shown by her were well worth the first prize awarded, as they would have been hard to beat in any company.

In female kids, Miss Mabel Holmes Pegler was well ahead of the other competitors, and her kid *Jeanette* secured not only first in its class, but also reserve for medal. A Toggenburg shown by Mr. Thomas was second, though very closely pressed by Lady Burdett-Coutts's *Marigold*, which was awarded third.

Pigs.

Large White Breed.—Thirty-two pens were entered, as against 33 at Doncaster and 52 at Plymouth. For boars farrowed in 1891, the first prize went to a pig "good in body, but weak in head and neck." There was "no special merit in any of the other exhibits." Pens of three boars were a moderate class. Sows made a good class, "all the winners showing decided merit." Pens of three sows were also a good class, and "superior to the boars."

Middle White Breed.—Boars were "a very fair class." Sows "a very good class, the best in the White Pig section, the three winning sows being specially good." Pens of three sows "a poor class."

Small White Breed.—"These classes show a great falling off as compared with former exhibitions. The competition is weak and the merit indifferent."

Berkshires.—Over 42 per cent. of the total entry of pigs consisted of Berkshires, the display of which was good both in numbers and in quality. Of the dozen prizes which were awarded, Berkshire took five besides the championship, Dorset and Salop took two each, and Hants, Lancashire, and Warwick one each.

The old boar class contained several fair specimens, though not one came exactly up to the ideal of a first prize animal. The premier award, however, went to Sir Humphrey F. De Trafford for a boar which "had a good head, and was level and well-formed on the top, but the legs were out of proportion in length to match the medium depth of body." Mr. Edney Hayter's second prize boar was "a well-proportioned animal, properly marked and of good quality, but with rather a punchy, mean-looking head." Mr. Nathaniel Benjafield's third prize boar "was a long, level-growing pig of the best quality, and would have stood higher but for a slight weakness behind the shoulders." In the boar pig class, the entries of Mr. Alfred E. W. Darby and Mr. William Pinnock "were good level matching pens of very prime quality;" the former had the preference as possessing greater substance. Mr. J. W. Kimber's pen was also of good quality, but "two were narrow between the ears, and one had drooping ears."

As usual, the Berkshire breeding sows formed the strongest of the pig classes, 29 entries being present, of which as many as 13 were noticed. Mr. Pinnock obtained the first prize for "a smart young sow of only 15 months, of very true make and well-furnished; she was brought out in prime condition, still

had not lost her activity, and did not give the idea that her breeding qualities would be impaired." Mr. Kimber's second prize sow "had great depth of body, and with this was level, both on top and under." Mr. W. A. Barnes was third with "a very grand sow, not quite in the condition of the first and second prize sows, and showing a slackness along her sides more than her want of condition would account for." The Champion prize for the best Berkshire boar or sow found its winner in Mr. Pinnock's sow. Sow pigs were above an average class as to numbers and quality. Mr. Benjafield's first prize pen "contained three pigs of great substance; they were also well matched, though two of them had a shade too much white." Mr. Kimber's second prize pen "were level and good, but had not the substance." Mr. Darby was third with "a pen of the best quality, but spoilt by one having a mean-looking head."

Any other Black Breed.—There were only 13 entries, and whilst "most of those which were of the acknowledged type were undersized, the rest were, without exception, deficient in coat." For boars, the Duke of Hamilton and Brandon was first for "a fairly good specimen, level, long, and well-bred." The same breeder was first for boar pigs with a pen of small but well-matched animals. In the two female classes Mr. George Pettit was first in the older class for "a fairly good sow with plenty of hair."

Tamworths.—A larger show of Tamworths might have been looked for, the 46 pens which were entered falling half a dozen short of the number in each of the two preceding years. As has been the case in recent years, the breed continues to show increasing excellence, and "true Tamworth character was observable throughout all the classes." The weakest class was that of the old boars, but the sows included at least 10, out of a total entry of 14, of really first-class animals. In the pens of three, both boars and sows, "there were individual animals which must come to the front in future years."

Poultry.

The Poultry Classes opened with the *Dorkings*, which, both in entries and in quality, were very good. *Old English Game* afforded evidence of the steady progress and of the return to popularity of this excellent old strain, the quality being well maintained both in the adult and in the chicken classes. *Indian Game* were a truly splendid collection, and the general quality was beyond praise, notwithstanding the moult of the adults and the immature condition of some of the juveniles. They are not

only handsome as show birds, but are wonderful table fowls, and, as a "cross," make a solid foundation for the most useful commercial fowls. Cornwall and Devonshire seem to be, at present, the chief centres of the breed. *Houdans* and "*Other French Breeds*" were only a moderate show, but the winners were all of the right type. In the case of the three next breeds—*Brahmas*, *Cochins*, *Langshans*—the adult birds as a whole were very good, but the majority of the young birds were disappointing in quality and size. *Wyandottes* made a fine display, the chicken classes being especially noticeable both for numbers and excellence. These useful laying fowls, recently introduced from America, have seldom been seen to better advantage. Silvers were in the majority and carried off the palm; still, there was a fair number of Golds. *Plymouth Rocks* were a high-class show, the cocks being especially good—"big, fine, strapping birds of the approved beauty of feather." The hens were weathered and somewhat out of form. The cockerels were worthy of special notice, particularly the winners. In the pullets, the legs were bad in colour, and form and feather were not what they should be.

Minorcas were a grand collection, especially the adults, which, notwithstanding the advanced period of the season, were well preserved, in ruddy health, and in sound plumage. The chickens were somewhat disappointing. *Andalusians* were rather poor in the cock class—"lobes tinged and faces bleached were the prevailing faults." The hens, on the other hand, were distinctly good; "it is rare to find at any show a lot of hens of this kind possessed of such evenly good-all-round properties." Cockerels did not realise expectations, but the pullets were better. *Leghorns* were represented by Browns, Whites, and Buffs, there being no Piles, Duckwings, Blacks, or Cuckoos. The display called forth high praise, especially the pullet class, most of which had started upon their ovipositing career, thus supporting the contention that the Leghorn is probably the best of the early layers. *Hamburgs* were somewhat poorly represented as to numbers, but the prize-winners were very fair in quality. *Any Other Variety* showed a marked improvement on last year's exhibit; with an entry of fifty-two of assorted kinds quite an instructive display was made.

Ducks and *Turkeys* were fairly represented in numbers, and the quality was very good.

Table Poultry.—The Judges in this section have furnished the subjoined report:—

The entries this year show a further advance over the exhibitions at Plymouth and Doncaster, as the subjoined table will indicate:—

	Warwick 1892	Doncaster 1891	Plymouth 1890
Pure-bred Cockerels	8	6	6
Pure-bred Pullets	8	7	7
Cross-bred Cockerels	10	6	1
Cross-bred Pullets	10	8	2
Pure-bred Ducklings	7	5	8
Cross-bred Ducklings	4	6	5
	47	38	29

As is seen, the entries of pure-bred fowls do not make much increase, nor yet either class of ducklings; but it is satisfactory to note that cross-breds have each year shown a steady improvement, and the introduction of these classes is thus justified, for, be it noted, these are only for first crosses between two pure breeds.

In these classes at all the previous Shows where they have been provided, only those birds were killed which the Judge selected for that purpose, but this year it was made a condition that all should be slaughtered. Many birds proved better than were expected, and taking the Show as a whole the display was very good indeed, though some exhibits were a little too old and were full of pin feathers. This was specially noticeable in the duck classes.

The work of killing and dressing was expeditiously and well performed by Mr. Thos. Newby of Leeds.

The following are our notes on the respective classes, together with weights, alive and dead. It should be mentioned that each bird was weighed separately, both before and after killing, but the lower limbs were not removed as at Doncaster:—

Class 240. Pair of cockerels of 1892 of any pure breed. Eight entries; six pairs exhibited.

No.	Alive	Dead	Prize
664.	Indian Game. (1) 3 lb. 7 oz.; (2) 3 lb. 4 oz.; small, but good shape.	(1) 3 lb. 3 oz.; (2) 3lb. 2 oz.; both fairly plump; No. 2 yellow and rough.	
665.	Indian Game. (1) 3 lb. 6 oz.; (2) 3 lb. 8 oz.; a better pair.	(1) 3 lb. 3 oz.; (2) 3 lb. 5 oz.; a nice, plump pair; but yellow and spoiled by pin feathers.	3rd
666.	Indian Game. (1) 3 lb. 9 oz.; (2) 4 lb. 6 oz.; unevenly matched; one weak on legs.	(1) 3 lb. 4 oz.; (2) 4 lb.; rather too old, not nice colour; one plump, but not a good couple.	
667.	White Legged Old English Game. (1) 5 lb. 7 oz.; (2) 5 lb. 6 oz.; well formed and good size; but No. 2 in-kneed.	(1) 5 lb. 3 oz.; (2) 5 lb. 2 oz.; No. 2 best in colour of flesh; transparent skin and plump.	2nd
668.	Indian Game. (1) 5 lb. 4 oz.; (2) 6 lb. 4 oz.	(1) 5 lb.; a beauty, splendid flesh and very plump, best bird in class; (2) 5 lb. 15 oz; coarse.	h.c.
671.	Dark Dorkings. (1) 6 lb. 8 oz.; (2) 6 lb.; a nice pair.	(1) 6 lb.; (2) 5 lb. 4 oz.; best pair; one rather dark in flesh and a little too old; very plump, good breasts.	1st

Class 241. Pair of pullets of 1892 of any pure breed. Eight entries; seven pairs exhibited.

No.	Alive	Dead	Prize
672.	Black Plymouth Rocks. (1) 4 lb. 8 oz.; (2) 4 lb. 6 oz.; nice looking black birds, dark legs.	(1) 4 lb. 2 oz.; fairly good shape and colour; (2) 3 lb. 15 oz.; better in colour; both good in skin, but small.	3rd

No.	Alive	Dead	Prize
673.	Indian Game. (1) 3 lb.; (2) 2 lb. 12 oz.; very small.	(1) 2 lb. 10 oz.; excellent colour, plump and clear skin; (2) 2 lb. 9 oz.; also plump, but full of feathers.	
674.	Indian Game. (1) 3 lb.; (2) 2 lb. 12 oz.	(1) 2 lb. 12 oz.: plump and good breasts, but yellow; (2) 2 lb. 10 oz.; better of the two, very plump, good flesh and skin.	2nd
675.	Dark Dorkings. (1) 5 lb. 6 oz.; (2) 4 lb. 14 oz.; well grown, good legs.	(1) 4 lb. 15 oz.; flat in breast, fleshy, but coarse; (2) 4 lb. 8 oz.; plump, but spoiled by pin feathers and coarse skin.	
676.	Indian Game. (1) 4 lb.; (2) 4 lb. 3 oz.; smart good pair of pullets.	(1) 3 lb. 10 oz.; a good bird, nice colour and skin, very plump; (2) 3 lb. 14 oz; coarse, bad colour and full of feathers.	
677.	Indian Game. (1) 5 lb.; (2) 4 lb. 7 oz.; short and good in breasts.	(1) 4 lb. 12 oz.; very fleshy and fine in skin, but carrying a lot of yellow fat; (2) 4 lb. 3 oz.; nice colour of flesh and skin, plump and well developed.	h.c.
678.	Silver Grey Dorkings. (1) 5 lb. (2) 4 lb.; nice pair, capital legs and feet.	(1) 4 lb. 8 oz.; good colour, beautiful skin, long and fleshy; (2) 3 lb. 8 oz.; equally good, but slightly bent breast-bone; not a well-matched pair, but splendid in quality.	1st

Class 242. Pair of cockerels of 1892, of a first cross between any pure breeds. Ten entries; eight pairs exhibited.

No.	Alive	Dead	Prize
680.	Langshans and Indian Game. (1) 4 lb. 2 oz.; (2) 3 lb. 12 oz.; showing the Langshan type.	(1) 3 lb. 12 oz.; good colour, shape and skin; (2) 3 lb. 7 oz.; very plump, excellent colour, but short.	2nd
681.	Langshan and Malay. (1) 3 lb. 12 oz.; (2) 3 lb. 14 oz.	(1) 3 lb. 6 oz.; nice skin and shape, rather dark in flesh; (2) 3 lb. 8 oz.; better in colour, good shape, and plump.	h.c.
683.	Plymouth Rock and Scotch Grey. (1) 4 lb. 4 oz.; (2) 3 lb.; mottled legs; a bad match.	(1) 3 lb. 11 oz.; good colour and skin, nice shape; (2) 2 lb. 13 oz; very thin and bony.	
684.	Game and Dorking. (1) 5 lb.; (2) 4 lb. 7 oz.; nice legs.	(1) 4 lb. 9 oz.; big, but coarse, badly bent breast-bone; (2) 3 lb. 15 oz.; coarse in skin, dark flesh, also bent breast-bone.	
686.	Dorking and Brahma. (1) 4 lb. 12 oz.; (2) 4 lb. 8 oz.; of the Brahma type, bony, white legs.	(1) 4 lb. 4 oz.; fairly plump, coarse in skin, full of pin feathers; (2) 4 lb.; very coarse and rough, thin in flesh.	
687.	Indian Game and Dorking. (1) 2 lb. 14 oz.; (2) 3 lb. 10 oz.; white legs, but dark.	(1) 2 lb. 10 oz.; small, but good in skin and flesh; (2) 3 lb. 4 oz.; fairly plump, not so good in skin, and uneven.	3rd
688.	Indian Game and Dorking. (1) 3 lb. 14 oz.; (2) 4 lb. 3 oz.; of the Indian Game type; yellow legs.	(1) 3 lb. 10 oz.; coarse in skin and badly bent breast-bone; (2) 3 lb. 10 oz.; a better bird, good skin.	

No.	Alive	Dead	Prize
689.	Indian Game and Dorking. (1) 4 lb. 2 oz.; (2) 4 lb. 1 oz.	(1) 3 lb. 11 oz.; darkish in flesh, and slightly bent in breast-bone, but good shape and plump; (2) 3 lb. 10 oz.; very plump; a well-matched good pair, might be better colour.	1st

Class 243. Pair of pullets of 1892, of a first cross between any pure breeds. Ten entered; seven pairs exhibited.

No.	Alive	Dead	Prize
691.	Langshan and Indian Game. (1) 3 lb. 2 oz.: (2) 2 lb. 12 oz.; showing the Langshan character.	(1) 3 lb.; very plump and compact, good colour; (2) 2 lb. 7 oz.; very similar, but not so good in colour of flesh.	3rd
693.	Old English Game and Dorking. (1) 3 lb. 12 oz.; (2) 3 lb. 8 oz.; handled well, nice shape, and white legs.	(1) 3 lb. 8 oz.; (2) 3 lb. 4 oz.; a beautiful pair, excellent colour, fine skins, and very plump.	1st
694.	Minorca and Black Hamburg. (1) 3 lb.; (2) 3 lb. 8 oz.	(1) 2 lb. 10 oz.; plump, but coarse in skin, fair colour of flesh; (2) 3 lb. 1 oz.; very bad skin, yellow flesh, and coarse.	
695.	Game and Dorking. (1) 3 lb. 6 oz.; (2) 3 lb. 2 oz.; fair size and shape, good legs.	(1) 2 lb. 13 oz.; plump, but coarse in skin, and full of pin feathers; (2) 2 lb. 11 oz.; plump, good shape, fair colour of flesh.	h.c.
696.	Minorca and Game. (1) 3 lb. 2 oz.; (2) 3 lb. 6 oz.; this description seems inaccurate, as the birds had feathered legs and heavy hocks.	(1) 2 lb. 11 oz.; dark in flesh, good skin; (2) 2 lb. 15 oz.; plump, good skin, dark flesh, and fat.	
697.	Indian Game and Dorking. (1) 2 lb. 4 oz.; (2) 2 lb. 6 oz.; very small, but a nice pair.	(1) 1 lb. 14 oz.; dark in flesh; (2) 2 lb. 3 oz.; capital colour of flesh, and nice skin.	
699.	Indian Game and Dorking. (1) 3 lb. 6 oz.; (2) 3 lb. 2 oz.; good white legs.	(1) 2 lb. 15 oz.; very plump, good shape and colour, but full of pin feathers; (2) 2 lb. 11 oz.; not so good, rather darker in flesh, and coarse.	2nd

Class 260. Pair of ducklings of 1892, of any pure breed. Seven entered; six pairs exhibited.

No.	Alive	Dead	Prize
795.	Aylesbury. (1) 5 lb. 13 oz.; (2) 5 lb.; rough and in bad condition.	(1) 5 lb. 7 oz.; very plump, good colour of flesh and skin; (2) 4 lb. 10 oz.; plump, but yellow, and as a pair, uneven.	
796.	Aylesbury. (1) 4 lb. 9 oz ; (2) 4 lb. 7 oz.	(1) 4 lb. 2 oz.; fleshy, but coarse in skin; (2) 4 lb. 2 oz.; good all through, capital shape and colour.	3rd
797.	Aylesbury. (1) 6 lb. 12 oz.; (2) 5 lb. 12 oz.; well shown, long in bodies.	(1) 6 lb. 4 oz.; a little coarse, but plump, and good colour; (2) 5 lb. 5 oz.; equally good, but much smaller.	2nd
798.	Aylesbury. (1) 5 lb. 12 oz.; (2) 6 lb.; well shown, and a nice looking pair.	(1) 5 lb. 5 oz.; fleshy and well made, fair colour; (2) 5 lb. 8 oz.; ditto, but full of feathers. Best pair.	1st

No.	Alive	Dead	Prize
799.	Aylesbury. (1) 4 lb. 2 oz.; (2) 4 lb. 7 oz.; very young, yellow legs and beaks.	(1) 3 lb. 12 oz.; (2) 3 lb. 14 oz.; full of feathers and wanting in flesh.	
800.	Pekin. (1) 4 lb. 12 oz.; (2) 4 lb. 12 oz.	(1) 4 lb. 6 oz.; (2) 4 lb. 7 oz.; fair size, full of feathers.	

Class 261. Pair of ducklings of 1892, of a first cross between any pure breeds. Four pairs entered and exhibited.

No.	Alive	Dead	Prize
801.	Aylesbury and Pekin. (1) 3 lb. 14 oz.; (2) 4 lb.	(1) 3 lb. 10 oz.; (2) 3 lb. 12 oz.; plump, and nice colour.	
802.	Aylesbury and Pekin. (1) 5 lb. 12 oz.; (2) 5 lb. 6 oz.; dirty and badly shown, but good long bodies.	(1) 5 lb. 8 oz.; (2) 5 lb. 3 oz.; a capital pair, good colour, and very plump.	1st
803.	Pekin and Aylesbury. (1) 5 lb. 3 oz.; (2) 4 lb. 10 oz.	(1) 4 lb. 12 oz.; (2) 4 lb. 6 oz.; both fleshy and plump, but rough.	2nd
804.	Pekin and Aylesbury. (1) 4 lb.; (2) 4 lb. 4 oz.	(1) 3 lb. 12 oz.; (2) 4 lb. 1 oz.; rough, and wanting in flesh.	

The dates of hatching are in many cases given in the Catalogue, and it would be desirable to make this imperative in future.

As already mentioned the birds were not drawn, nor were any of the lower limbs removed, so that the loss could only be by feathers and evaporation. The latter is most important, as indicating the breeds which lose least, and the influence of condition upon weight when dead.

From a comparison of the live and dead weights of each bird, as recorded in the statement on pp. 515–8, it will be seen that, as was the case at Doncaster, the greatest loss is found in pure bred Dorkings, and the smallest in the Indian Game, though an equally slight reduction (2 oz.) took place with one of the Langshan and Indian Game entries.

Cheese.

With fewer classes for cheese than last year, there was a larger number of entries, the total having been 70 at Warwick, as against 55 at Doncaster. In addition, the Judges consider there was marked improvement on previous exhibitions. All classes were for the current year's make. *Cheddar* was a very good class, "clean in flavour, and having keeping qualities." *Cheshire*, on the other hand, with few exceptions, left a good deal to be desired. *Stilton* was fairly represented, and some of the exhibits were excellent. *Cheeses of any other British make* included several exhibits of superb quality. *Cream cheese* was generally good, the prize lots being "of good make and fine quality."

Butter.

The entries numbered 164, or about a score less than at Doncaster. On each occasion three classes were provided, though the conditions were not identical in the two years. Class 271, for two pounds of fresh butter, slightly salted, made up in pounds, was a very large one, in which nearly half of the

exhibits obtained full points for quality. Those to which the four 5*l.* prizes were awarded, "reached the highest points of excellence; nothing could surpass their firmness of texture and cleanness of flavour." In Class 272, for six pounds of fresh butter, made up in pounds, and delivered a week before the judging day, the greater number of the exhibits had become more or less deteriorated through having been made too long a time before the Show. The prize lots, however, "had well stood the test, and showed fine quality and excellent dairy work." Of Class 273, for one keg or other package of salt butter, not less than 14 lb. in weight, the Judges remark, "Considering the early period of the year at which these exhibits were of necessity salted down to meet the regulations of the Society, the quality was very good, and showed that the curing of butter was well understood."

Cider and Perry.

Though the Show was nearer to the cider-growing districts, the total entries in this section did not exceed those at Doncaster in 1891. The 28 entries were contributed from six counties, namely: Gloucester 8, Hereford 6, Devon 5, Norfolk 3, Somerset 3, and Worcester 3. The dozen prizes were thus distributed: Gloucester 5, Hereford 4, Norfolk 2, Devon 1.

The cider in casks (Class 274) was generally of very good quality, the first prize sample of Mr. John Watkins being excellent. Of bottled cider, made in 1891, several of the samples were exceedingly good and in capital condition, and the first prize lot was equal to any the Judge had ever sampled. Bottled cider, made before 1891, was all sound and in good condition, Mr. Henry Thomson's first prize sample having kept remarkably well.

As regards Perry, "the first prize lot was equal to good class champagne, the second and third were also preferable to many sparkling foreign wines, and the other sample was very sound and good."

Jams and Preserved Fruit.

There were five entries in the competition for the best collection of whole fruit jams, and generally they were very good, "taking into consideration the wet season and almost sunless summer" of last year. The bottled fruits exhibited were of first-class quality. The class for preserved fruits for dessert purposes, and that for dried or evaporated fruits for cooking purposes, unfortunately attracted no entries whatever.

Hives and Honey.

In this section there were 154 entries arranged in 16 classes. The following are the salient points in the Judges' report:—

The interest in Apiculture—as evinced by the eagerness of the manufacturers of appliances to gain the coveted awards, the spirit of inventiveness displayed in the production of numerous fresh objects as well as the further development of others already in use, and the long list of entries in the honey classes from all parts, as well as the technical knowledge shown by numerous visitors—appears to have taken a strong hold upon a rapidly increasing class throughout the United Kingdom.

Referring to what was expressed in last year's report as to the favour with which the work of the bee was regarded, it may be safely inferred that the intervening period has more than sustained that interest, and that beekeeping is becoming firmly established as a national industry.

With the disadvantage of the earlier period at which the Show is now held, the display of honey was highly creditable; many of the exhibits being in excellent condition and of fine flavour. But, owing to the cause just stated, the beekeepers of the district in which the Show was held were conspicuous by their absence from the competition.

The task of discriminating and awarding the prizes in the hive classes was one calling for great care. The excellence of material and workmanship, combined with close attention to details, marked generally the whole of the exhibits. The principles of construction were observed; and where defects did exist they were attributable apparently to oversight. In the class for the best and most complete hive for general use, a combined hive and hiver was exhibited, the purpose of which is to supersede the prevalent practice of allowing the bees to swarm and choose their own course of action by intercepting the flight of the queen bee, and giving her and the bees access to a hive placed above the one from which they have issued. As the practice is as yet almost untried in this country, experiment is needed to demonstrate its practical usefulness. A noticeable feature in this class was the increasing favour with which hives having a loose and separate outer casing or covering appear to be regarded by makers of bee-appliances, a majority of those staged being constructed on these lines. As a general rule, it may be said that the tendency is towards lightness and simplicity in hive construction while relying on the 'box within a box' principle for protection to bees from winter cold and summer heat, instead of the heavy and cumbersome hive of an older date.

In the class for cottagers' hives some exceedingly good and useful articles were shown, though we deem it preferable that the price be kept as near as 10*s.* 6*d.* as possible rather than as high as 15*s.*, the latter being altogether too much to expect a cottager to pay for a hive, however good value it might be for the money.

Of new inventions nothing very striking was shown, the chief interest being drawn to the various devices for self-hiving swarms of bees as already referred to. That this would confer a general benefit upon, and be a perfect boon to, a large class of beekeepers, who are perforce compelled to be absent from their bees at swarming time, is certain, and if eventually we should evolve from the various devices at present untried a really efficient appliance for the purpose, it is sure to be in great demand. But we must await reports of the success or failure of those at present devised, when they shall have been submitted to a practical test, before pronouncing definitely on their merits.

On the other hand, the contrivances for clearing bees from surplus honey chambers, as exhibited last year, have been so entirely successful after trial that no improvement upon them was even attempted on this occasion, if we except a double cone in lieu of a single one. The introduction of super clearers has been one of the most decided advances in Apiculture of recent years, as it entirely removes one of the most serious objections to the locating of bees near to dwelling-houses, much trouble being sometimes caused in the removal of honey by injudicious or inexperienced persons.

The Butter-making Competitions.

The Dairy occupied as nearly as possible the centre of the Show-ground, and the public interest which it excited was as great as ever. The larger part of it was devoted to the competitions, whilst an annexe was set apart for the churning operations of the dairymaids who gave the demonstrations. Twice each day Miss Maidment delivered addresses, illustrated by working details, which were closely followed by large crowds of people. At noon on the Tuesday, the Royal party from the Castle paid a visit of inspection to the Dairy.

The following competitions of butter-makers were arranged:—

Class 1.—Open to the United Kingdom. 19 entries.

Class 2.—Female members of a farmer's family not in service or working for wages. 23 entries.

Class 3.—Dairymaids in service who have never won a prize exceeding 1*l.* in value at any competition. 3 entries.

Class 4.—Dairymaids residing in the Society's District F (Gloucester, Hereford, Monmouth, Salop, Stafford, Warwick, Worcester, and South Wales). 8 entries.

Champion Class.—Open only to the prize winners in Classes 1, 2, 3, and 4.

The Judges have sent in the subjoined report:—

With the exception of Class 3, the competition in all the classes has been good and the entries very fair.

With regard to the work done, the same remarks will apply to all the classes, as most of the competitors were eligible for each class.

In many cases indecision was apparent as to the proper time at which to stop churning, and while there were a few cases of over-churning, under-churning was a more frequent error. All the competitors made good use of their thermometers, but in several cases they did not show skill in deciding the temperature of the cream for churning, or take the temperature of the atmosphere into sufficient consideration. As a result of over-churning, over-working, and, in some cases, over-washing, the butter made by several of the competitors was deficient in colour and flavour.

In several cases less time might have been taken with the entire process.

On the whole the butter was not so well freed from moisture as was desirable, and the butter produced was tough and deficient in grain and texture. The competitors were allowed as much ice as they desired, and as a result several of them mixed ice with their butter at all the different stages after the butter-milk had been removed from the churn.

We cannot but think that a too liberal use of ice was made in this way, and that this was one reason why in some cases the grain of the butter was spoilt by over-working. We should like to suggest that a limited quantity of ice be, in future, given to each competitor.

In Class 3 only three dairymaids in service entered; this was unfortunate, as it is most desirable that this class should be well represented.

In the Champion Class the work was very well done, the butter made showing less moisture than on any of the previous days. At the same time the old fault of over-working was apparent in many cases.

We desire to call attention to the fact that one competitor took two first prizes and the Champion prize, and to suggest that in future a rule be made, that any competitor who has won a first prize during the week should not be allowed to compete again except in the Champion Class.

Horse-Shoeing Competitions.

The contests were limited to shoeing smiths in the Society's District F, comprising the counties of Gloucester, Hereford, Monmouth, Salop, Stafford, Warwick, Worcester, and South Wales. Two classes were arranged, the first for roadsters, with 22 entries; the second for dray horses, with 7 entries. The regulations included the following:—

"Each competitor will be required to make a fore and hind shoe out of the new iron provided by the Society, to take off the fore shoe and put the new one on. The hind shoe will be retained by the Steward.

"In awarding the prizes, the time taken in the forging and fitting of the shoe will be considered by the Judges.

"Each candidate will also be required to undergo an examination by the Judges, satisfying them that he possesses an adequate knowledge of the construction of the horse's foot.

"A competitor must bring his own tools and provide his own striker if he requires one; but the Society will provide forge, anvil, iron, nails, and fuel."

The Judges report that some very good work, as fireman, was done in both classes, but particularly in the cart-horse class, the shoes being well forged and properly holed. In putting the shoes on, however, the men were somewhat timid in driving the nails, consequently the latter were not got high enough into the wall of the hoof to properly hold the shoe on. This defect was more especially noticeable in the roadster class, particularly if the foot was at all broken. It is attributed to the circumstance that the fireman who makes the shoes does not as a rule put them on, hence the Judges suggest whether it would not be desirable to give some encouragement to the doorman (that is, the nailer on), who really undertakes the more responsible work during the operation of shoeing. "As regards knowledge of the structure of the horse's foot, it was very limited, and, curiously enough, the best workman knew positively nothing about it."

The length of time occupied was somewhat protracted, but the prize winner in Class 1 was $31\frac{1}{2}$ minutes, and did his work well. In Class 2, the first prize went to a youth of nineteen, a splendid workman, but rather slow. The competition in this class was so keen that it was necessary to request four of the men to place the hind shoe on before the awards could be decided.

On the last day of the Meeting, Professor Pritchard delivered a lecture on Farriery at the Shoeing Forge, which was attentively followed by a large number of workmen and other visitors to the Showyard.

Conclusion.

From a technical point of view, this the fifty-third annual exhibition of the Royal Agricultural Society, adds another to the many successful Country Meetings which the Society has held. The almost idyllic surroundings of the Showyard, the admirable displays in the various departments of the Show, and the hearty co-operation that was rendered locally, combined to make the Meeting one which will be remembered with pleasure and satisfaction by all who took part in it. The exhibition attracted many visitors from beyond the seas, some of whom had travelled long distances in order to be present. At the same time they took advantage of the opportunity of enjoying the charming scenery, which, whilst generally characteristic of our "rolling Midlands," reaches its highest degree of development in the beautiful county of Warwick.

W. Fream.

MISCELLANEOUS IMPLEMENTS EXHIBITED AT WARWICK.

A casual visitor walking through the Implement Department of a Royal Show might be puzzled to say in what respect it differs from previous Meetings. There is a marked similarity in the general appearance; the same neatness and regularity of arrangement are apparent in the stands, the same busy beating of the engines and buzz of machinery in motion attract a crowd of sightseers, some of whom seem never to tire so long as they see the wheels going round; others display a knowledge and interest which show that they are experts. Agriculturists from all parts of the country congregate here to learn what progress

has been made since the last Meeting, what new thing there is that science has to show them, and to judge how far they can utilise it, and associate it with practice at home.

Many of the best known large manufacturing firms are so fully occupied in producing the machinery and implements for which they are specially noted, that it is not to be wondered at if they do not devote very much of their time to producing novelties or new implements. There are, however, other equally well-known exhibitors, who are always eager to follow the signs of the times, and to take up anything that shows a prospect of future development.

Some implements would seem to be so effective and complete as not to require improvement; others, again, though effective, seem capable of much simplification, and there are some (of which we meet with a stray exhibit or two at every Show) which (although they would be of great use and benefit to agriculturists) are not yet practically enough developed. As each year comes round, it brings forth new designs, new ideas, and new requirements, and thus inventors have always before them a wide range for the exercise of their time and ingenuity.

It is to encourage progress in this direction that the Royal Agricultural Society offers Silver Medals to "new implements for agricultural or estate purposes, or to new improvements in such implements," and we have only to look back through the volumes of the Journal to see how successful this system has been in stimulating inventors and exhibitors.

Take the recent case of the Oil engines. At Nottingham, in 1888, Messrs. Priestman Brothers were awarded a Silver Medal for a horizontal petroleum engine, and at the Jubilee Show at Windsor the following year, the Judges emphatically showed their approbation by again awarding a Silver Medal to the same firm for their portable oil engine.

It must be a subject of congratulation to the Society, which has thus from the first recognised the special advantages the oil engine may offer to agriculturists, and the possible future before it, to find that the encouragement given has resulted in bringing out the splendid collection of oil engines which was to be seen at Warwick—certainly one of the special features of the Show, and reflecting the greatest credit upon the manufacturers. In the case of the "Hay-Kickers" also, the award of a Silver Medal at Windsor stimulated makers so much that an increased number were exhibited at Warwick, six of them under the head of "new implements." The Judges (Mr. Thomas H. Thursfield, Barrow, Broseley, Salop; and Mr. Robert Wallace, Auchenbrain, by Mauchline, N.B.) felt some difficulty in dealing with these two

classes of exhibits, and they addressed a recommendation to the Stewards of Implements to the effect that they were unable to consider an award to petroleum engines and hay kickers without a trial, which it would be impossible to conduct without preliminary preparations, and they therefore suggested that the question of competitive trials of these two classes should be considered.

I. Awards of Silver Medals.

Three Silver Medals were awarded to the following:—

No. in Catalogue.	Exhibitor.	Nature of Implement.
3102	George Cotton & Co. Willaston, near Crewe	Hand riddles (patent) for potatoes, &c.
4015	T. C. Fawcett, Hunslet, Leeds .	Fawcett's patent brick and tile making or pressing machine combined.
5191	J. A. Partridge, Tenbury . .	Stringer (patent), for use in conjunction with Partridge's patent continuous string system for hop yards.

Article 3102. *Messrs. Geo. Cotton & Co.*, Willaston, Crewe. Hand Riddles.—The improvement in these consists in making the wire bottoms of the riddle separate from the riddle: they are thus movable and interchangeable. By this arrangement one wooden rim will serve for a number of wire bottoms, which can be made of various-sized meshes, and changed as required, according to the work to be done. The wire bottoms are woven of various meshes upon a circular rim of wire, and fit inside the wooden rim, and are held firmly in position by the spring of the wire rim. They rest upon four or six wires drawn across the bottom of the riddle at right angles, and thus the wooden rim is not weakened so much as by having holes bored in it for each wire separately, and it is not so liable to split. The riddles are more easily stored, as one rim will answer for a number of wire bottoms, and several can be put into it when not required. Iron handles are provided at the sides, which are an advantage. The labour in production is much less, and the cost is therefore reduced.

Article 4015. *Mr. T. C. Fawcett*, Hunslet, Leeds. Brick and Tile Making or Pressing Machine combined (Fawcett's patent).—This is a *convertible* brick and tile making, or brick and tile pressing, machine (fig. 1), driven by steam power. The pressure is effected by the patent toggle levers, which give two distinct slow pressures; the first, or inward pressure, when the toggles are not quite perpendicular; the second, or

outward pressure, when the centres of the toggles are all in a perpendicular line, the last pressure there by being one-eighth inch more in length than the first, resulting in a more uniform thickness and a better face (see Journal, Vol. XXII., 2nd Series, 1886, p. 556). The bricks or tiles are made from clay automatically fed to the mould from the hopper by a sliding

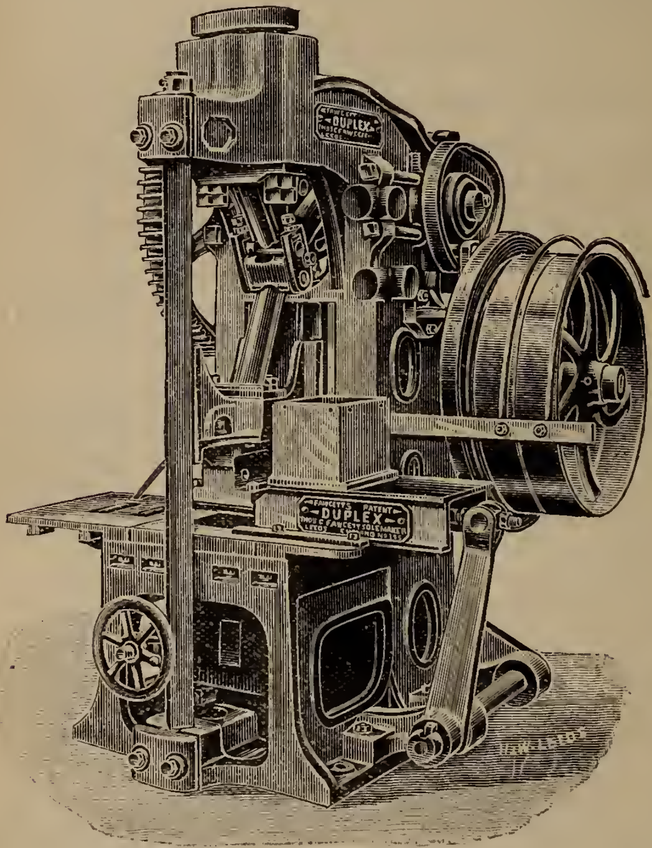

Fig. 1.—Fawcett's Brick and Tile Making or Pressing Machine.

charging box, and are automatically delivered from the machine. To convert it into a pressing machine, the hopper and charging box are removed, and a pushing arm attached for automatically delivering the bricks to the mould. It is calculated to make from 6,000 to 8,000 bricks, or to press 10,000 bricks or tiles per day. By a very simple alteration of the press, or die, the machine can be adapted to press bullnose, or chamfer bricks,

ornamental tiles, flooring tiles, quarries, &c. The modifications in this machine by which it is made easily convertible, and can be adapted to various uses and thus become more generally serviceable, commended it to the Judges.

Article 5191. *Mr. J. A. Partridge*, Woodston House, Tenbury.—This is a very simple implement, and consists of a piece of curved metal ($\frac{3}{4}$-inch) tube, about 6 inches long, fastened upon the end of a wooden handle, and used as a lead for string, in conjunction with Partridge's patent continuous string system for hop-yards. Posts are placed at certain distances apart in the hop-yards, and support two parallel lines of wire, 3 feet apart, 12 feet above the ground, and also one single line of wire over the hop plants, 9 inches above the ground, with wire hooks fastened upon each line of wire. With the aid of the "stringer" the continuous string is looped on to the first hook, and then carried from hook to hook, being fastened with a peculiar twist upon each hook, passing up and down, and diagonally across from one line of wire to the other, and thus forming a rigid network of string to support the growing hop vines. The string system is used by many growers, and is said to be efficient and to provide a substitute for hop poles. The labour saved in stringing an acre of hops with the "stringer" and continuous string must be considerable in comparison with the usual method of cutting the string into lengths, and fastening one length at a time to top and bottom wires. There must be also less waste of string. We were informed that the saving amounted to nearly 80 per cent.

The most important feature in the Implement exhibits was the very large and interesting collection of gas and petroleum oil engines, by several different makers; and, in order to demonstrate the various purposes to which they may be applied, they were in several instances exhibited driving pumps, dynamos, or hoists.

II. Gas Engines.

At the Liverpool Meeting of the Society in 1877, a gas engine exhibited by Messrs. Crossley Brothers first attracted the attention of the Judges (see Journal, Vol. XIV., 2nd Series, 1877, p. 150). For several years subsequently at the Society's Shows similar engines by the same firm, but with improvements in detail, were exhibited. It has been reserved for recent years to see a great development in the increased power of these engines. Such increase, together with the number and stand-

ing of the firms exhibiting, is not only an indication of the demand for such engines, but points to the direction in which such demand arises.

The gas engine is no longer an engine useful merely for intermittent work of small power. On the contrary, it is establishing itself in regular running factories as a rival of the steam engine—one firm having in hand at the moment six engines of 100 horse-power; and where used in conjunction with its own Dowson gas-producing plant, it gives highly economical results.

Although most of the gas engines exhibited were similar in principle, in their details there was just so much difference as would arise either with the view of further simplification of some parts, or of avoiding the use of some detail of another maker which happened to be inconveniently protected by a patent.

The Otto Cycle, described in the report on Messrs. Crossley's engine in Vol. XIV. (2nd Series) of the Society's Journal, is that generally used. The Campbell and the Trent Gas Engine Companies, however, adopt a different system, described in the notice of their exhibits.

The one important improvement in gas engines generally is the substitution of the ignition tube for firing the charge, instead of the original slide valve and flame. The slide valve, especially where gas was at all foul, was a source of trouble, and the flame firing direct was affected very much more by draughts than the system now adopted.

Taking the exhibits in their catalogue order, the first were those of *Messrs. Robey & Co.*, of Lincoln (Stand 249), who exhibited two gas engines, one of 5 and the other of 12½ horse-power. They are designed under Messrs. Richardson and Norris's patent, and work on the Otto Cycle. They are similar in arrangement to the oil engines exhibited by the same firm, which will be found described later, with the exception that the firing of the gas is done by an ignition tube.

Messrs. Wells Brothers, Sandiacre, Derby (Stand 252). A small gas engine of ¼ horse-power was exhibited as a "new implement." In its arrangement it is a distinct departure from all the other gas engines,—the novelty consisting in a rotary valve placed at the back of the cylinder through which the mixture of gas and air is admitted, and which also controls the exhaust. The valve is actuated by a ratchet wheel and pawl worked by a rod from the prolongation of the crank-pin of the engine. While the engine is running at its normal speed, one tooth of the ratchet is engaged by the pawl at each revolution of the engine. If the speed increases, the pawl acts as an inertia governor, and slips over the ratchet wheel without engaging in

it, in which position the exhaust valve remains open and no fresh charge is taken into the cylinder. It is only during the act of rotation of the valve that a charge of gas or air is taken.

A light spiral spring connected to the pawl may be so adjusted as to vary the normal speed of the engine within certain limits. The cylinder is not water-jacketted in the ordinary way, an open tank with loose cover being cast round the cylinder.

Messrs. J. E. H. Andrew & Co., Ltd., Reddish, near Stockport (Stand 255). The above firm exhibited three of their engines known as the Stockport gas engines; they work on the Otto Cycle, and have been exhibited at previous Shows of the Society. On the larger engine (14 horse-power) is fitted a self-starting apparatus, consisting merely of a valve by which live gas is admitted into the cylinder, and, mixing with the air therein, forms an explosive mixture. This passes, together with the air in the cylinder, through the incandescent tube, which is fitted with a valve on top to allow of the passage of such gas; and so soon as the proportions of the escaping gas and air are such as to form an explosive mixture, it is fired by a gas flame and starts the engine. Such an arrangement answers for starting the engine when running light, and obviates the necessity of pulling it round by hand; but as there is no compression of the charge previous to ignition, the force of the explosion would not be sufficient to start the engine against any considerable load.

Messrs. Tangyes, Ltd., Birmingham (Stand 256), exhibited seven gas engines of various sizes, from 2 horse-power to 16 horse-power nominal, all working on the Otto principle, but having certain details (fig. 2), protected by the exhibitors, for which special advantages are claimed. First among these is the particular form of combustion chamber, and the manner in which the charge of gas and air is admitted to the same. Instead of the "pot" shaped chamber the form used is a bent-shaped cone—described as Pinkney's Patent Ignition Chamber—the gas and air being admitted at the smaller end of the same, where also the firing takes place. This provides for a more gradual explosion, whereby the sudden shock at the commencement of the forward ignition stroke of the engine is to some degree minimised, while, owing to the slower combustion, the pressure is rather better maintained throughout the later portion of the stroke.

With the view of ensuring a complete admixture of the gas with the air, the gas enters the space below the inlet valve through several horizontal holes, while the air is admitted vertically. The inlet valve is opened mechanically, and does not close until after the gas valve is shut. A communication is

made between the air inlet space and the gas passage up to the gas valve; in this way, so soon as the gas valve closes, air, which is still free to enter the cylinder, sweeps out the gas left in the passage in front of it into the cylinder, which gas would otherwise have been wasted if, on the succeeding stroke, the engine is held by the governor.

The governing of the engine is effected by a hit and miss governor actuating the spindle of the gas inlet valve. At the normal speed of the engine an inclined plane, forming part of the striker, slides smoothly against a fixed pin; if, however, the speed increases, it engages against it with sufficient force to throw it out clear of the spindle of the inlet valve. A simple starting arrangement is provided in the form of a small hand

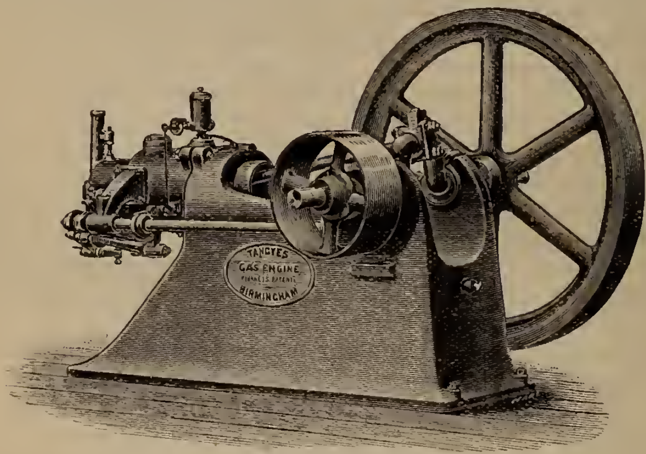

FIG. 2.—Tangyes' Gas Engine.

pump, by which a charge of gas is pumped into the cylinder, which mixes with the air already therein, and is compressed to about 10 lb. It is then fired, the explosion of such charge being stated to be sufficient to start the engine with one half load on it.

The lubrication of the cylinder is effected by a very simple positive action lubricator, by which a small but regular supply of oil is provided.

Messrs. Fielding & Platt, Gloucester (Stand 257). In the three engines exhibited by this firm there has been a distinct endeavour to simplify, and to reduce the number of, the working parts. In the 4 horse-power engine exhibited there is but one cam on the side shaft, which, by means of a rocking lever, actuates the valves. The gas valve is controlled by a hit and miss governor,

while the exhaust valve and the valve for the mixture of air and gas consist of one double action valve, with a mushroom head and piston. The first part of the rise opens the mushroom for the exhaust passage, and in the third portion the passage for the explosive mixture is opened. This arrangement is adopted for the smaller sizes of engines up to 20 horse-power; beyond that power each valve is worked by its own cam and lever. The illustration (fig. 3) shows one of the smaller engines.

The larger engine is fitted with a self-starting appliance, consisting of a vessel fixed close to the engine, into which air is pumped at a pressure of about 40 lb. by means of a hand pump.

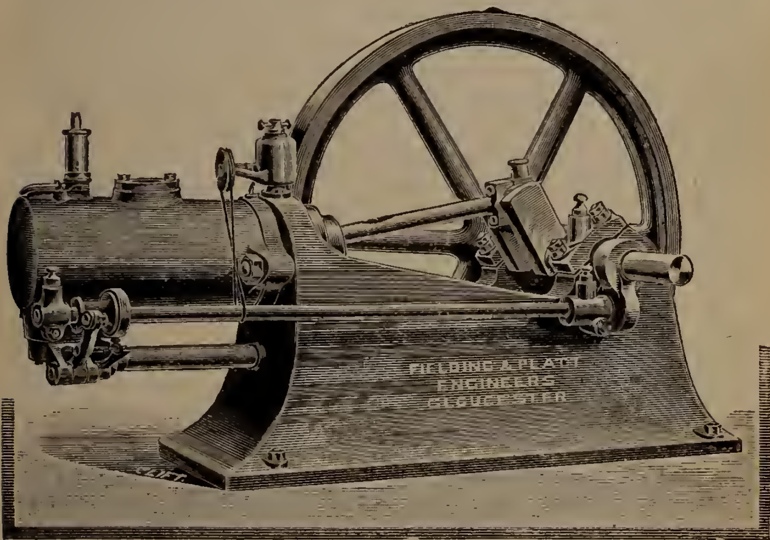

FIG. 3.—Fielding & Platt's Gas Engine.

When the engine is about to be started, the gas supply valve to the cylinder is opened, the gas displacing the air contained in the cylinder. The cock on the air receiver is then opened and the compressed air admitted, which, mixing with the gas, forms an explosive mixture.

The firing is effected by means of an ignition tube heated in the usual way by a Bunsen burner.

The *Campbell Gas Engine Co.*, Halifax (Stand 258). In these engines a departure is made from the Otto Cycle; three were exhibited, of 1 horse-power, 3 horse-power, and 6 horse-power respectively. They are designed so as to give an ignition at every revolution of the crank when required; as a consequence, the

engine for a given power is smaller than an engine having one ignition for every two and three revolutions of the crank. It is also claimed that the engine is more regular in its working, and this should be the case, provided that sufficient flywheel weight is supplied to allow of fairly uniform running on light loads, when firing would not take place at every revolution.

The design of the engine is extremely simple, the main departure from those of the Otto type being the horizontal pump placed alongside the cylinder, by which means the charge of air and gas is pumped into the cylinder at a pressure of about 10 lb. to the square inch. Just at the point at which this pressure is attained in the pump, the exhaust port in the engine would be open. The compressed mixture is, therefore, free to pass into the cylinder, through a self-acting non-return valve in the communicating passage, driving before it the remaining products of combustion in the cylinder. On the return stroke of the main piston compression takes place, and just at the turn of the stroke it is fired by the ignition tube.

The strength of the explosive mixture may be varied, according to the work required of the engine, by a regulating cock on the inlet, sudden variations being controlled by the governor.

Messrs. T. B. Barker & Co., Birmingham (Stand 259). These engines are again of the Otto type, the gas, air, and exhaust valves being worked in the ordinary way by cams on the side shaft. There were no special features in these engines except that on the larger engine exhibited a starting arrangement was provided, in principle similar to that, already described on the Stockport engines, of introducing a charge of live gas into the cylinder at the ordinary gas pressure and firing the same, which is found to answer if the engine is running light.

The Trent Gas Engine Company, New Basford, Nottingham (Stand 260). The engine exhibited by the Trent Company is, in its design, a distinct departure from all others, though, like the Campbell engine, it receives, when fully loaded, an ignition at every stroke.

The engine consists of one long cylinder of two diameters, in which works a double-headed trunk piston, the forward cylinder constituting a pump, while the smaller or back one is the driving cylinder. In working, on the outward stroke gas and air are drawn into the annular space formed between the larger cylinder and the smaller piston; on the return stroke the mixture is driven out and compressed into the explosion chamber, and is then ignited, the force of explosion actuating the smaller piston.

The gas supply valve is operated upon and regulated by a

hit and miss governor, while the inlet and exhaust valves are actuated by a vibrating lever and rods from eccentrics on the crankshaft.

The ordinary speed of the engine, though much lower than that of other gas engines, is claimed to be more uniform when running on full load and taking an explosion at every revolution.

Messrs. Crossley Brothers, Ltd., Manchester (Stand 261). The general design and excellence of the work in the engines of this firm are familiar to visitors to the Show. Though for some years they held a practical monopoly, they have kept pace with the requirements of the times, and with their present exhibit of six engines, ranging from 3 to 85 horse-power, they may fairly claim to maintain the position they have earned.

In connection with their 33 horse-power engine (Art. 4107) is exhibited a new self-starter, which certainly meets the necessary requirements of giving the engine the desired double revolution better than many others which claim to do so. The starter consists of a hand-pump with gas and air inlet valves so proportioned that just the proper admixture shall be pumped into the cylinder. To start the engine, the crank is placed so that about one-third of the forward stroke shall have been travelled, and the air valve is propped open. The hand pump is then started, first of all charging a considerable length of pipe between it and the cylinder with the gas and air mixture, as also the air pipe. The air valve is then closed, and a light is applied to a small valve on the hand-pump. This causes an explosion in the pipe communicating between the pump and the cylinder, which, in the act of explosion, drives a certain amount of the charge in front of it, and therefore considerably compresses the charge in the cylinder previous to firing it. At the next outward stroke of the engine the charge is taken from the mixture which had been pumped past the air valve, when propped open, into the air pipe or box. It is claimed that with this arrangement the engine can be started with a considerable load on.

III. Oil Engines.

At the Society's Meeting at Plymouth in 1890, when a special prize was offered for engines of this class, only two competitors came to the front, and while the results obtained by one of these engines were eminently satisfactory, the other engine proved itself to be in a very crude state of development.

Since then, one or more additional engines have been presented, but the excellent collection exhibited this year bore

evidence in a remarkable manner to the energy and attention which are now being devoted to the development of this type of engine. Without speculating in any way as to the limit of power which these engines may attain, there can be no doubt that they possess special features which must commend them for farm purposes.

Not the least important of these is the advantage they offer, where work is intermittent, as is frequently the case in dairy work and the like, of being capable of starting at a few minutes' notice, without the delay and attendance necessary in getting up steam in a boiler. Similarly, at stopping, there is no waste the moment the supply of oil is turned off from the engine.

Arranged as a portable engine, there need be none of the continual daily expenses of carting fuel or water, as in the case of a steam engine. The oil engine may go into the field, carrying a sufficient supply of oil for an ordinary week's work, together with its supply of water for circulating round and cooling the cylinder, it only being necessary to make good occasionally the small quantity lost by evaporation.

There is no more risk of explosion than in the case of a steam boiler—if as much, while all risk of fire from sparks from the chimney is eliminated.

In the report on the trials made at Plymouth (Journal, Vol. I., 3rd Series, 1890, p. 580) a very clear statement of the fuel consumption and its cost is made. Since that time other reliable tests of a similar engine have been made in which even better results were obtained. What the results of a competitive trial of the several engines might be, it would not be safe to conjecture. Suffice it to point out that the engine which obtained the prize at Plymouth has not been allowed to stand still, modifications in details having been effected with the view of increasing its efficiency; and, further, competitors have now come into the market with engines from which great things are hoped, and upon the relative merits of which it is impossible fairly to judge without a sufficient trial.

Adhering to the order in the Catalogue, the first oil engines met with were those of *Messrs. Robey & Co.*, Lincoln (Stand 249), who exhibited two petroleum engines, one (Art. 4021) mounted as a portable engine, the other (Art. 4022) as an undertype engine, both most attractive as regards the appearance of their general arrangement, approximating as they do very closely to that of steam engines of the same class.

In the portable type the engine (fig. 4) is mounted on the top of a cylindrical vessel resembling very much the boiler of the steam engine. This cylindrical vessel is divided into two

parts, one part forming a tank of 250 gallons capacity for the circulating water, while the forward part forms the silencing box for the exhaust from the engine, and has the exhaust funnel mounted on it. Underneath the water tank, and corresponding in appearance to the lower portion of the fire-box and ash-pan of a steam engine, is a rectangular vessel capable of holding 36 gallons of oil, the whole being mounted on wheels.

The water circulating pump and the oil supply pump are

FIG. 4.—Robey's Portable Petroleum Engine.

both worked direct from the cam shaft. The oil is delivered into a passage outside the combustion chamber at a pressure of about 160 lb. At first starting, a fan worked by hand and a simple Lucigen oil lamp are used for a few minutes to raise the combustion chamber to the proper temperature, after which the repeated explosions maintain the temperature sufficiently. The air and exhaust valves work continuously on a constant lift, actuated by levers and cams on the side shaft, but the admission

of oil is regulated by the governor, a lever from which trips the roller sideways off the cam, and thus prevents the oil admission valve opening. The excess of oil pumped flows back through a return pipe to the suction tank.

The oil with which the engine was working was a coarse oil, having a specific gravity of ·850 to ·860, with reported flashing

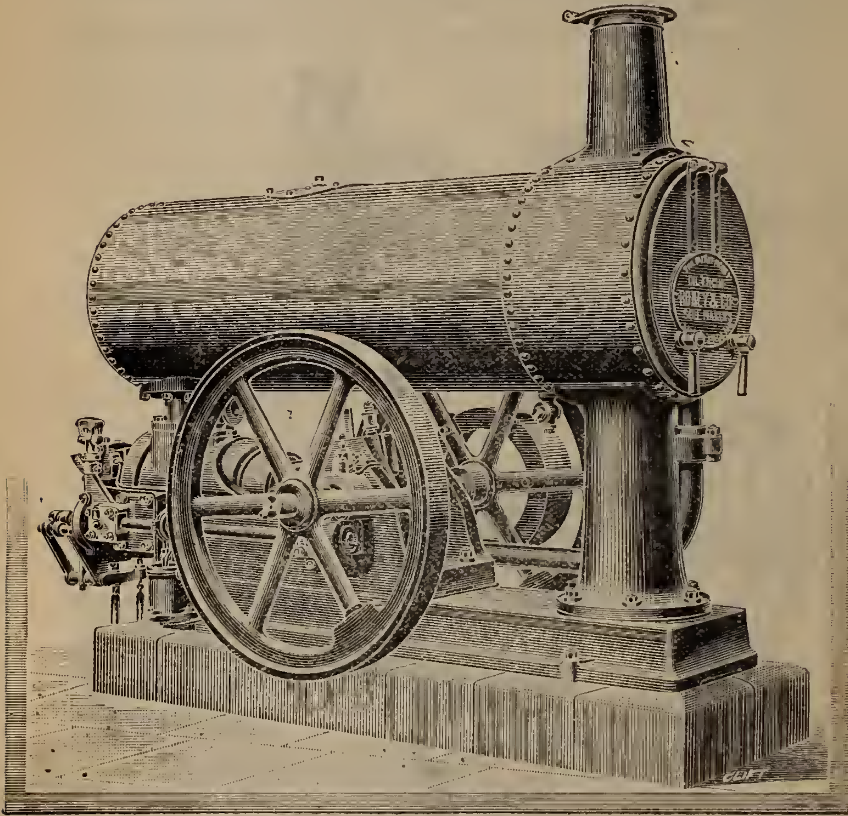

FIG. 5.—Robey's Undertype Petroleum Engine.

point of 240° Fahr., the price being 4*l.* 15*s.* per ton or 263 gallons.

The engine is described as of 5 effective horse-power, and, though no test was made of the consumption of oil, it may fairly be assumed that it might be sent out with its water and oil vessels fully charged, and that they would not require re-charging for a week.

The undertype engine (Art. 4022) is an admirable arrange-

ment for a fixed engine. In it (fig. 5) the vessel containing the circulating water is placed above the engine, and it is only necessary to connect the cylinder to it with a flow and return pipe, when natural circulation will be maintained without the necessity for any pump. The engine itself is in all respects similar to the portable engine already described.

Messrs. Crossley Brothers, Manchester (Stand 261), exhibited two petroleum engines, one of 4 horse-power nominal, the other of 9 horse-power. Their general arrangement follows very closely that of the gas engines by the same firm, the oil being converted into gas previous to its introduction into the cylinder. An oil tank of sufficient capacity for ten hours' running at full power is provided in the base of the engine. From this tank a small double-barrelled pump delivers the oil, one barrel delivering to the engine cylinder, while the other delivers to a small tank supplying the lamp for heating the vaporiser and ignition tube. The suction stroke of the pumps is effected by an inertia governor actuating a small rocking shaft, the delivery stroke is effected by a crank action and gab motion at the end of the side shaft. In starting the engine, or at other times, it may be necessary to increase or diminish the supply of oil to the cylinder; in order to do this, the pumps are arranged with a tappet action, and by inserting a washer between the pump plunger and the crosshead working the same, the desired variation in the stroke of the pump is obtained. This particular adjustment applies only to the pump delivering into the vaporiser; the other pump supplying the lamp having a constant delivery, and any excess of oil flowing back to the oil tank. In the vaporiser, which is heated by a Lucigen lamp, the oil follows a circuitous path, is there converted into gas, and passes through an inlet valve, regulated by the governor, into the cylinder. When the inlet valve is opened, the vapour is drawn into the cylinder, meeting a supply of air introduced through an automatic air valve, and a further small supply of air follows the charge of gas drawn through a passage surrounding the case of the firing tube and, passing through the combustion chamber, completely scavenges the passages. A timing valve worked by cams in a sliding sleeve on the side shaft regulates the firing.

Messrs. Priestman Brothers, Ltd., Holderness Foundry, Hull (Stand 262). This firm exhibited two of their Horizontal Engines, one of 5 horse-power, the other of 18 horse-power, also one 5 horse-power Portable Engine, and one 5 horse-power Vertical Engine. The horizontal and portable engines have already been illustrated and described in former reports in the Society's Journal—the horizontal engine in the Nottingham

and Plymouth reports. At the former Show it received one of the Society's Silver Medals; at the latter, the special prize offered in a competitive trial of oil engines. The portable engine received a Silver Medal at the Windsor Meeting of the Society, and is described and illustrated in the report of that Show. The vertical engine has been designed specially for use on board towing barges and launches. An interesting diagram was exhibited by Messrs. Priestman, consisting of a map of England, with the locality of the number of engines placed in England marked on it. It shows very clearly the rapid growth of this business.

Messrs. Weyman & Co., Ltd., Guildford (Stand 263). The engine exhibited by this firm and described as a new implement, is the outcome of Knight's Engine, which appeared in the Plymouth trials. Since that time it has been modified very considerably, and in its present form very favourable reports have been made of its working. The engine in question was stated to be of 4 horse-power nominal, giving 6 horse-power actual on the break, and is known under the name of the "Trusty" Engine. The arrangement of the engine is similar to that of a gas engine. Two cams on the side shaft actuate the air and exhaust valves, which are placed on the underside of the cylinder. The oil pump is worked by a trip controlled by the governor. The oil passes from the reservoir into which it is pumped to the vaporising chamber, at the end of which is attached an ignition tube similar to that used in a gas engine. The ignition tube is heated by the flame from an oil lamp blown by an air pump, operated from a disc and crankpin on the end of the side shaft by means of a bell crank lever. The engine works on the Otto Cycle, and is very simple in its general arrangement. A Weyman Engine was also exhibited (Stand 94) by Messrs. Clayton & Shuttleworth, who manufacture these engines under a licence.

Messrs. Penny & Co., Lincoln (Stand 265). A $2\frac{1}{2}$ horse-power engine on Weatherhogg's Patent was exhibited by this firm. Owing, unfortunately, to a breakage which occurred to the pump, it was not seen in operation. This was the more to be regretted as its mere appearance was not very taking. The engine differs from other oil engines in that the ratio of the gearing of the side shaft is 3 to 1: thus an explosion, when on full work, only takes place every third stroke, one idle revolution being a cleansing stroke. The oil is pumped into the vaporiser, which is heated by an oil lamp, at a pressure of about 70 lb., and then passes through a reducing valve into a chamber, where it is mixed with atmospheric air on its way to the

combustion chamber. The engine was mounted on wheels as a portable engine.

Messrs. Richard Hornsby & Sons, Ltd., Grantham (Stand 266). Several modifications have been made in the "Hornsby-Ackroyd" Engine since it was exhibited last year, and described and illustrated in the Journal. The principle of the engine remains the same, but whereas last year the oil was pumped direct into the combustion chamber, a governor regulating the supply by throttling the suction, in the present engine the petroleum pump—which is always running—is worked from the air valve lever, and the supply is regulated by a ball governor, which opens a relief valve on the delivery of the pump. A side shaft is now added, which, in addition to working the governor, actuates the air and exhaust valves through levers and cams. The modifications in the governing of the engine are a distinct improvement, as the engine tried last year was defective in this respect. Three engines were exhibited, of 12, 8, and 4 indicated horse-power. A large group of electric lights was shown, the dynamo supplying the current to which was driven by these engines, as illustrating a use to which, no doubt, such engines will be put.

IV. "Hay-Kickers."

The exhibit of back-action Haymakers, named at Windsor "Hay-Kickers," was very good and in excess of any previous Meeting. There seems to be a demand for them. They were all more or less alike, but generally claimed some special feature and improvement.

This type of haymaker was introduced from the United States, as the "Bullard" Haymaker, in 1864. It is an American invention, the patent being dated September 1863. It was first shown in England at Bristol, at the Meeting of the Bath and West of England Society in 1864, and was then described as having a "curious but effective" action of the forks. Only about half-a-dozen machines were then sent over. One was sold for use at the Royal Farms at Windsor. Since then they seem to have received little attention until Mr. Gibbons exhibited the one at Windsor, for which he received a Silver Medal.

Article 1374. *Messrs. Ogle & Son*, Ripley, Derby, exhibited a "hay-kicker" in which a special feature is that the height of the forks is regulated by a small wheel running in the rear, thus adapting it to uneven ground.

Article 1729. *Mr. J. V. Gibbons*, Haseley, near Tetsworth,

exhibited a "hay-kicker" with Gibbons's patent coiled spring-teeth and several improvements.

Articles 3374, 3375. *Messrs. Barford & Perkins*, Peterborough, exhibited two "hay-kickers," or "Anglo-American hay-tedders." Both have a wind-guard attached to them, so that they can be worked in any direction with the wind in any quarter, and in this respect specially differ from those of other makers.

Article 4193. *Messrs. Ransome, Sims, & Jefferies*, Ipswich, exhibited a new "Ipswich" "hay-kicker" with several novel features. The spring fork-head is especially adapted for uneven land.

Article 4283. *Messrs. W. M. Nicholson & Sons, Ltd.*, Newark-on-Trent, also exhibited a "hay-kicker" which had a novel feature not shown in any of the others. The handle of each fork is a square piece of iron twisted, which runs through a square guide. This twist upon the handle causes the fork to twist as it is drawn upwards by the action of the crank, and thus the hand action of a labourer is as nearly as possible given to each fork or tedder.

V. Sheep-Shearing Machinery.

Article 4036. *Messrs. Burgon & Ball*, Sheffield, exhibited a sheep-shearing machine, worked by one of Priestman's oil engines of 2-horse power. Although the motive power is different, the working of this machine is somewhat similar to the one described in the Journal as an exhibit at Doncaster. The overhead driving gear starts a core passing inside a flexible tube or shield, and is connected to the machine shears or cutters, which are on the principle of the horse-clipper, and can be worked at any angle. A sheep was sheared in less than five minutes in the presence of the Judges. The skin of the sheep was not cut, and the wool was all taken off evenly and closely. The average English sheep farmer would not be likely to purchase such a machine for his own use, but in any place where a large number of sheep could be brought together for shearing it might be useful and probably economical. It has been decided by the Society to hold a trial of sheep-shearing machinery in connection with the Chester Meeting of 1893.

VI. Cattle Weighing Machines.

For many years the system of weighing cattle alive has been gaining ground in this country, and manufacturers have been eager to meet the demands of agriculturists by providing weighing machines suited to their special requirements. The

Markets and Fairs (Weighing of Cattle) Acts have further stimulated makers to provide cattle weighbridges suitable for auction marts and cattle markets generally. There was a large exhibit at Warwick of machines suitable for both purposes.

The following points should not be lost sight of, in any weighing machine intended for use where cattle are bought or sold by auction, or where live weight quotations are taken:—

1. The pen on the platform should be strong, but not heavier than is necessary, and should be so constructed that the animals cannot get their heads or legs through it. The bearings should be easily removable and renewable.
2. As much as possible the whole operation of weighing should be open to view by everyone around the sale ring.
3. The weighing lever, or steelyard, should be so placed and arranged that it may easily be seen that the machine is carefully adjusted before each lot of animals are put upon it, as from droppings, and various causes, this is most necessary.
4. It should also be open and easy for everyone to see that a perfect balance is obtained by the movement of the poise, or slide, and that the weight is correctly taken by the attendant.
5. The steelyard should be sufficiently long, and so arranged as to admit of the figures being large and clear, and the divisions as distinct as possible.
6. Anyone who wishes should be supplied with a ticket (printed by the sliding poise or otherwise), recording the weight which is seen to be indicated upon the steelyard by the poise, when the machine is balanced, as the cattle stand upon the platform.
7. The weight should also be shown in some prominent position in large figures (automatically or otherwise) apart from any other figures, and these should remain in view until the cattle are sold.

VII. Steam Digger.

Article 5382. *Mr. Frank Proctor*, of Knebworth, Herts, exhibited his Steam Digger, which it was arranged that the Judges should see at work on a field provided by the Society for exhibitions of steam-digging. The Digger in question was built in February 1887, and since that time has been used for the execution of contracts for digging up land, &c. The engines are of the compound type. The nominal horse-power is eight. It is an ordinary traction engine, with three digging forks at the rear, and is, I understand, the same implement which was exhibited at Nottingham, and which is described and illustrated by Mr. Pidgeon in his report on the Nottingham Meeting in the Journal, 1889.[1] The only alteration since that time consists in providing a throwing-out clutch to enable the driver to throw the digging forks in or out of motion, when required, without leaving the stoking platform. The Digger easily steamed into the field, up

[1] Vol. XXV. (Second Series), p. 105.

a rather sharp pitch rendered slippery by the rain of the previous night, and through the usual-sized farm gate. The driver managed it entirely himself, but there was an attendant who followed, and who had once or twice to put down one or other of the forks, by pressing them with his foot, when from turning or otherwise they had hinged up. The depth worked can be varied by using tines of different lengths; those on the Digger were for working six inches deep.

The field was a bare clover root, hard and dry, with a fairly strong loamy soil and gravelly subsoil, and was well suited for testing the work of the Digger. The three sets of forks together take 8 ft. 9 in. wide, just clearing the track of the travelling wheels. They are put to work at once without any delay, by simply hinging them down, and throwing the digging shaft into gear. A centre roller, capable of being raised or lowered, is fitted underneath between the travelling wheels so as the more evenly to distribute the weight of the machine over the land, and on light land to bring it down level before the forks enter the soil. The crank works at the top of the fork handles, and in an opposite direction to that which the rocking lever takes at the moment when the sod is broken off, thereby better ensuring the effectual moving of the sods. The driver preferring (as being more convenient) to commence work at some distance from the side fence of the field, and to work towards it, he left the usual headland along the top of the field, and worked down the field. The first digging moved all the soil to an average depth of six inches, leaving the land worked by the centre fork in a rough, broken state, in fact, in a very suitable state for fallowing. The two side forks did not turn all the sods over: sometimes they missed, and the sods fell back into position again, top uppermost, like so many huge bricks. The cause of this appeared to be that they worked behind the driving wheels of the engine, which had compressed the land more than the centre roller, which did not press the hard and dry surface of the land to any appreciable extent. The land dug by the centre fork was left higher than the other part, probably also from the same cause.

I consider that the first digging left the land in a good state for fallowing, with the exception of the misses I have named with the side forks. The second digging, across the "dug" portion, made much better work, but even here the centre fork was the most effective, as it seemed to turn the soil over better, and leave it lighter and rougher. The land was, however, left in a very satisfactory state, and would easily afterwards be worked by horses. The pressure of the travelling wheels (over about two-

thirds of the surface) evidently interfered very considerably with the effect of the side forks, although the land was not soft or wet. This may probably be remedied to some extent by adjusting the centre roller to carry more of the weight. The effect of pressure of this kind could only really be estimated by seeing the succeeding crop. Much would depend upon the description of the soil and the state of the land when the work was done. On some lands the compression would not reach so deeply as on others, and would not have so injurious an effect.

The following particulars as to work per day were given to me. The machine breaks up about five acres per day of ten hours during the summer—allowing for stoppages; it is regulated to travel at an uniform speed of about one mile per hour, and the depth to which the land is dug does not materially affect the quantity. It consumes from 11 to 15 cwt. of coal per day of ten hours, according to quality. The charge per day when hired out is from 10*s*. to 15*s*. per acre, according to circumstances, but the depth does not affect the charge.

VIII. Other Miscellaneous Implements.

Article 662. *Messrs. R. A. Lister & Co.*, Dursley, exhibited a Tester, the "Positive," for milk. This is described as a machine for ascertaining the actual butter-fat in new milk, skim milk, or whey. It is a method introduced by Dr. Babcock, of the United States, and is known as the Babcock method. The construction of the machine, which is turned by hand, is very simple. A circular pan, about four inches deep, revolves on a spindle; there are four cups or pockets in the pan, in which to place the test glasses, the number of pockets varying according to the size of the machine. An even number of test glasses should be put into the pan, and placed opposite to each other, to maintain the equilibrium. A quantity of milk, measured in a pipette, is put into a test glass which has a bulb with a graduated neck or stem. A measured amount of sulphuric acid is then added to it; the milk and acid are next shaken up and mixed; the mixture turns quite black, and the glass becomes very hot; it is at once placed in one of the pockets, and the pan is rotated for seven or eight minutes at from 400 to 500 revolutions a minute. The test glass is next filled up to a mark on the stem with hot water, hot water is also put into the pan to the depth of about two inches, and it is again rotated for one or two minutes; the glasses are again taken out and filled up with hot water to a certain mark on the gauged stem. If necessary, more hot water is put into the pan, and the

machine is again turned for a short time. The test glasses are then taken out; a portion has become separated and rises above the hot water. The quantity of this when read off on the graduated stem gives approximately the percentage of fat in the milk.

The Judges tried this machine in the dairy. Two samples of milk, from two cows, were put in the test glasses, and went through tho process described above. On reading off the results indicated, the operator declared that the one sample contained 4 per cent. and the other 3·4 per cent. of fat, but the line of division was by no means clearly defined, and it was difficult to determine it exactly. Two samples (duplicates) of skim milk, after passing through the separator, were also tested in a similar manner. They were declared to contain about 2 per cent. of fat. It was unfortunate that the operator was not better acquainted with the working. There appeared a good deal of laxity as regards proportions, density of acid and time of rotation, all of which must to a certain extent affect the result; it was not, therefore, surprising that two other tests wero not completed. The fault, however, was rather in the manipulation than in the machine.

Milk testers on this system are known to have given satisfactory results in the hands of a skilled operator, but it is open to question if reliablo results can always be counted upon in the hands of an inexperienced person.

Apart from the question, which the Judges could not then decide, as to whether the machine yielded accurate results, it was clear that the process was one which, though it might in the hands of a skilled or trained man be of considerable use, and might be employed with advantage in a factory, was not so capable of ready manipulation as to recommend itself for use by the ordinary farmer.

Articlo 753. *Mr. George Hathaway*, Chippenham, Wilts, showed a novel plan for fixing tho spokes of a ladder. The ends of the spokes are made taper, so that it is not necessary to bore a full sized hole through the spar, or to fasten the spoke by wedging or cross pinning. The spars are firmly held together with iron pins, which are fastened with a screw, and circular headed nuts. Ladders made in this way can easily be taken to pieces, and fresh spokes inserted with little trouble. They are stronger and less expensive to make.

Article 859. *Messrs. R. J. Harris & Son*, Rugeley, Staffs. This firm exhibited a Mowing Machine "constructed on an entirely new principle." The chief feature is the manner in which the pitman is driven, but it is doubtful whether the prin-

ciple is so novel as is claimed. Instead of driving the pitman from a crankpin on a shaft at right angles to it, the head of the pitman works between guides, and has a projection on it, which engages in a cam path slot in the periphery of a wheel on the first motion shaft. This may do away with one pair of wheels, but it is very questionable whether there is a corresponding saving in friction. A mere inspection of the machine leads one to the conclusion that it would be difficult to protect the wheel (which, in the case of the machine exhibited, was not protected at all) sufficiently to prevent dust and dirt to some extent choking the slot, and certainly materially increasing the wear and friction. Nothing short of prolonged working would thoroughly test this.

Article 1511. *Messrs. Lloyd, Lawrence, & Co.*, 34 Worship Street, E.C. A Canadian machine, distinguished by the name of the "Mercer Binder," and manufactured by Messrs. Mercer Bros., of Canada, was exhibited by this firm. The special feature consists in dispensing with travelling canvas aprons for conveying the corn across the platform and elevating the same ; to do which travelling chains, with rakes attached thereto, travel underneath the platform and up the incline. These platforms are decked with thin sheet steel through slots in which the teeth of the rakes travel. The corn is further assisted up the incline by vibrating rakes driven by chain gearing. As soon as the teeth of the elevating rakes have delivered the corn to the packers, they recede from the slots and travel back to the conveyor table.

Article 1841. *Messrs. J. Bisset & Sons*, Blairgowrie, Perth. With the same object in view—of doing away with canvas aprons—this firm exhibited a new reaper in which there are no elevating aprons, their place being taken by four endless steel chains, with prongs attached to them, the chains running in grooves so as to prevent the straw becoming entangled. The height to which the corn is elevated is very moderate, and the adjustment of the binding table is very convenient, the end of it being left open (as in the case of many other machines) to accommodate long straw. The machine has evidently been designed with the object of doing away with all unnecessary weight, so as to reduce the draught. The impression given is that, had rather more weight been provided, the machine would have been better adapted for general purposes.

Article 4314. *Messrs. J. & F. Howard*, Bedford, exhibited as a new implement a patent "Open-end" Sheaf Binder.

The Judges, however, felt that as the Society is proposing to have very complete trials of this class of machine next season, they could not deal with these exhibits.

Article 2435. *Messrs. Clarke & Son*, Brackley, Northamptonshire, exhibited a new patent portable weighing machine on the principle of the lever, or steelyard, with counterpoise weights, which can be stamped by the local authority, as they bear only one denomination. The 1 lb. weight is the counterpoise for 8 lb., the 14 lb. weight for 1 cwt., and so on. The advantage of this is that retail dealers in coal, &c., can use the counterpoise weights instead of having to carry a number of heavy weights about with them, and thus reduce their load very much. The whole apparatus, with weights, takes up little room; it can be fitted in a box underneath the cart, and can be hung for use on the side or back of the cart. The counterpoise weights must be carefully tested from time to time, as a little variation would affect the weight, but being stamped, and clearly marked, as a denomination of the Board of Trade standard, they are easily tested at any time. They are galvanised to prevent rust, and the whole apparatus is very portable.

Article 3020. *Mr. William Barnard*, Bolton Percy, Leeds. This was the only Hedge Cutter in the yard, but it was not tried, and consequently no opinion can be given of its working or efficiency. It consists of a strong frame or carriage mounted on two broad travelling wheels, four feet apart, with a shaft, or arm, carried on a slide, so that it can be extended, and also raised or lowered, to suit the hedge, by the driver as he stands on a platform behind. The cutting disc, four feet in diameter, works from a swivel point on the end of the arm, and has six knives or cutters in its circumference; it revolves at a high speed. The cutting action is upwards, and is said to be similar to a brushing hook.

Article 3753. *The Central Cyclone Company, Ltd.*, 32 Graham Street, City Road, N. Amongst the pulverisers exhibited by this firm, one was entered as a "New Implement," and described as No. 0 Class. It claims to be adapted for "grinding grain and other feeding stuffs, dry solid chemicals and phosphates"; and the pulverised samples exhibited showed the work to be well done. The capacity of the machine was rated at 20 bushels of beans per hour, fairly fine, or 8 cwt. of phosphates. It consists primarily of two fans driven separately, and revolving at a high speed close to each other, but in no way close enough to give a grinding action. The blades of the fan consist of rectangular plates of hard, chilled metal, placed at a particular angle with the axis of the fan. The machine being started, the material to be pulverised is fed in and caught by the blades of the fan, the high speed at which they are running at once driving the material to the periphery or

points of the blades. At the bottom of the fan space is an air inlet which can be adjusted to any extent; if only opened to a small extent, the fan draws in but little air, and consequently the rate at which the pulverised material is blown over is but slow, and a fine sample is produced; with an increased inlet of air it passes over more rapidly, and the sample is coarser. An examination of the fan blades after they have been at work some time is interesting, as they show distinctly that it is only the forward corner or point of the rectangular blade which is brought into operation and is subject to wear; consequently the blades may be turned so as to present a fresh leading point until all four corners are worn. The machine is well constructed, and its design bears evidence of considerable experiment and thought.

Article 3940. *Messrs. Ruston, Proctor, & Co., Ltd.*, Lincoln, exhibited on their stand an 8 horse-power Portable Engine, in the construction of which they have introduced important improvements upon their former engines. The engine and boiler are, practically speaking, distinct. The steel brackets for carrying the various parts and bearings of the engines are all riveted to the shell of the boiler, which is then placed under a planing machine, and the surfaces of the brackets are planed all over to their required levels. The various parts of the engines are then bolted to these brackets; thus the whole or any part of the engine may be dismantled without touching the boiler. This system of construction especially commends itself for such engines as have a double crank with an intermediate bearing between them. In order to prevent any straining of the main crank bearing which is stayed to the cylinder, due to the unequal expansion of the boiler and the ordinary stay, a patent steam stay is used in which steam is made to circulate—thus keeping the expansion of the stay uniform with that of the boiler.

Article 4191. *Messrs. Ransome, Sims, & Jefferies*, Ipswich. New Patent Double Row Potato Planter (Miles and Arter's Patent). This machine (fig. 6) is constructed on the same principle as the single row planter described last year in the Journal as an exhibit at Doncaster, but with several improvements. It is now fitted with a pole for two horses and a seat for the driver within easy reach of the regulating lever. It is arranged to plant two rows at a time either on the flat or on the ridge, with or without manure; a track wheel is provided, which forms a groove in the manure, placed between the ridges, and thus ensures that the potatoes drop in a line on the manure.

The gearing is also much improved. The working is much the same as in the single row machine. The needles or forks

catch up the potatoes and carry them up to the hopper or spout, a cam then draws the spring out and releases the potatoes, which are gradually lowered down till they fall out of the guide. The guides can be varied to plant from 24 to 32 inches apart, and the distance apart in the rows can be varied from 12 to 16 inches. The Judges tried this machine with several descriptions of potatoes. With very large potatoes once cut, the planting was not very regular, and some of the potatoes were crushed in the hopper; and with very small "pig" potatoes there were many double sets but few blanks. With graded potatoes, such as are

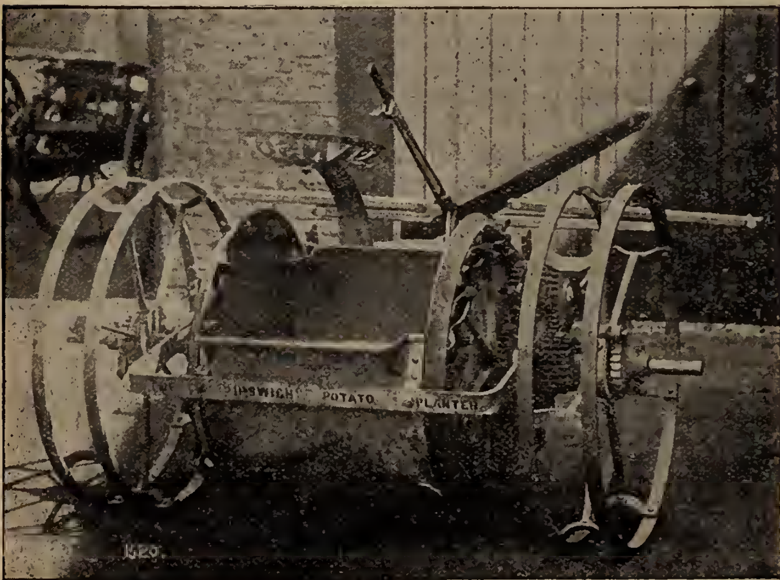

FIG. 6.—Ransome's Ipswich Potato Planter.

usually planted, the planting was regular and good. For planting on the flat, adjustable breasts are put on, to form the furrow into which the potatoes drop. Tho draught appeared heavy. The Judges, whilst fully appreciating the improvements and alterations made in this machine since the Doncaster Meeting, whereby it is rendered more generally useful and capable of adaptation to the various methods of potato planting followed in different localities, did not think it was sufficiently advanced and perfected to allow them to award it a Silver Medal.

Article 4192. *Messrs. Ransome* also exhibited a New Patent Potato Digger. There are several special features about this

machine (fig. 7). A share passes under the potatoes to loosen the soil, the rotary raiser then follows. The prongs generally used on the rotary machine to raise the potatoes are here made in the form of small breasts, or skims, which have a raising action, and seem admirably adapted to throw the potatoes out and separate them from the soil. The arrangement by which, with one movement of a lever, the depth of the share and digging breasts can both be adjusted together is novel. This is accomplished by a double frame, hinged. The upper frame is rigid with the pole, and carries the arm on which the digger is fixed, and also the share; the lower frame carries the road wheels and axle.

FIG. 7.—Ransome's Potato Digger.

The Judges would much have liked to try this machine, but it was not possible to get a crop in such a state as to give it a fair trial. They think it has every appearance of doing the work required of it in an efficient manner.

Article 4280. *Messrs. W. N. Nicholson & Sons*, Newark-on-Trent, exhibited a Danish Milking Machine (Jens Nielsen's Patent). This, as exhibited, was a very crude machine (fig. 8). It is suspended from a cradle fitted across the back of the cow, and can be raised or lowered at will. There are two pairs of cushions, covered with india-rubber, having an approaching, rocking, and receding movement, produced by eccentrics working on either

side, driven with a chain and crank handle. The upper edges close first on the upper part of the teat, and, as they open, the lower edges close in a similar manner. The suction is obtained by pressure, and not by pulling. The pressing action of the cushions seemed to draw the milk in an intermittent manner not unlike the action of hand-milking. The inventor showed the machine at work at the Heathcote Dairy Farm, belonging to Lord Warwick. The first cow was a long teated one; the two front teats were well-stripped of milk; the two hinder ones, not being quite so long, were with difficulty kept in the machine; one had a little milk left in it, the other had had none taken from it. Other cows were tried with no better result. The cows stood very quietly, much more so than would be expected, but it was evident that, although the action seemed somewhat like the action of hand-milking, and would milk one teat at a time fairly well, the trouble of adjustment and work of turning the handle took quite as much time, and also as much exertion, as milking by hand would do.

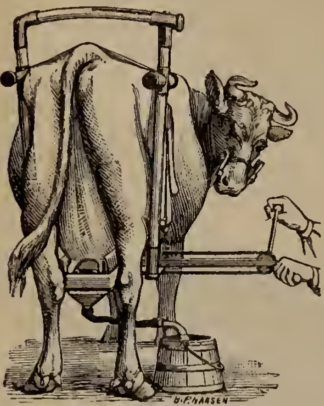

FIG. 8.—Danish Milking Machine

Article 4281. *Messrs. Nicholson* also exhibited a compound vertical engine and boiler (fig. 9) of 4 horse-power nominal of very simple design, which ought to give more economical results in working than a single-cylinder engine of the same power. The cylinders are placed alongside each

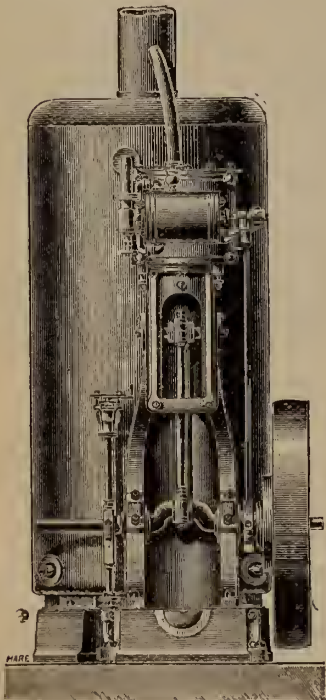

FIG. 9.—Nicholson's Vertical Engine.

other, mounted on cast-iron standards secured to the cast-iron base plate which also carries the boiler. The piston rods of both cylinders are connected to one cross-head from which the connecting rod leads to the crank of a single throw shaft. A horizontal cylindrical valve chest connects both cylinders, and a valve, having the necessary passages for the proper distribution of the steam, is actuated therein by means of a single eccentric and rod. The boiler attached to this engine was of the well known Field type.

Article 4357. *Messrs. Shand, Mason & Co.*, 75 Upper Ground Street, S.E. Among a selection of hose couplings exhibited by this firm was one which has only just been brought out, and, as we understood, was the first one made of the kind. The object aimed at, as in other "catch" couplings, is rapidity of coupling together with security; in this particular coupling both these requirements seem to have been obtained. Inside the female end of the coupling, two segmental rings are let into a recess, one end of each being pivoted therein, the other end projecting out of the groove and held out by a spring. The male or spigot end has a projecting ring with a groove behind it; it is therefore only necessary to push the two unions together, the projecting ring on the male end pushes back the two spring segments in passing, but so soon as the grooved space comes opposite to them the ends engage in the groove and make a secure coupling. Although as a coupling it possesses many advantages over the ordinary screw coupling, discrimination must be exercised in its use. In case of fire, it is so essential to have the couplings of all available hose interchangeable that a new type of coupling is only allowable where no additional hose is likely to be called into requisition or where such coupling is adopted by the local fire brigade. A reducing socket may be kept in stock for connecting up other hose in case of fire, but this makes one more union to be hunted for at a time when everyone is in a state of confusion.

There was one exhibit which had never before appeared at a Royal Show, but which, I think, should be warmly welcomed. I refer to Stand 371—the Warwickshire County Council. This stand was especially interesting to those who are taking any part in the Technical Education movement in the various County Councils. They could see there what was being done in Warwickshire as to agricultural lectures and classes. I have no doubt many useful hints were picked up which will be turned to good use elsewhere.

Nothing remains for me now to do but, on behalf of the

Judges, to thank the Stewards of Implements, Mr. Percy Crutchley and Mr. S. Rowlandson, for their kind attention and guidance, and also the exhibitors for their courtesy and consideration. I have myself also to acknowledge, most fully and cordially, the very valuable assistance I have received from Mr. F. S. Courtney, the Engineer, both at the time of the Meeting, and also in connection with this report.

Farmers in bad times are not prone to invest in implements if they can do without them. I was, however, pleased to learn from many exhibitors that the Show had been a successful one for them from a business point of view, and I trust the Society and exhibitors may meet many times as pleasantly and successfully as at Warwick in 1892.

THOS. H. THURSFIELD.

THE FARM PRIZE COMPETITION OF 1892.

THE Local Committee for the Warwick Meeting of the Royal Agricultural Society, continuing the custom of previous years, offered this year the sum of 300*l.* in prizes for the best kept farms in that county, under the conditions given below:—

Class I.—For the best managed arable and grass farm of over 250 acres, of which not less than a third shall be arable. First Prize, 80*l.*; Second Prize, 40*l.*; Third Prize, 20*l.*

Class II.—For the best managed arable and grass farm of over 150 acres, and not exceeding 250 acres, of which not less than one-third shall be arable. First Prize, 60*l.*; Second Prize, 40*l.*

Class III.—For the best managed arable and grass farm of over 50 acres, and not exceeding 150 acres. First Prize, 40*l.*; Second Prize, 20*l.*

Warwickshire, to the boundaries of which this competition was limited, may justly claim to be one of the most interesting counties in England. Renowned in literary history beyond any other region on the surface of the globe as the native county of Shakespeare,

For the man of all men was a Warwickshire man,

there is hardly a town within its borders whose name is not writ large in "our rough island story." Rich, however, as it is in antiquarian and sentimental interest, it is not less prominent as a centre of the many-sided activity of modern life. Geographically the "heart of England," commercially it is, as far as some important industries are concerned, its brain. In point of natural beauty and advantages, Warwickshire, as a

whole, can hold its own with the most favoured districts of England. The scenery presents little of the grander and sterner aspects of Nature, but in its simple, reposeful, and truly English loveliness, it has a charm peculiarly its own. Though it has no mountains, and might, therefore, seem tame and flat to perfervid disciples of Mr. Ruskin, the gently undulating character of the whole surface redeems it from monotony. Geologically it is occupied almost entirely by the Liassic, Upper and Lower Triassic, Permian, and Carboniferous formations. The climate is mild and wholesome, and favourable not only to the life, but to the health of vegetable produce. The abundance of plant-life in "leafy Warwickshire" makes it a happy hunting-ground for the botanist, and stocked the all-absorbing mind of Shakespeare with that wealth of plant lore which is one of his most striking characteristics. The soil is fertile, and, as a rule, bounteously rewards the toil of the husbandman.

Dowered as Warwickshire is with every advantage of soil and climate, it is no wonder that agriculture flourishes there. If Nature has done much for it, man has also done his share in bettering her handiwork. About five-sixths of the whole area of the county are under tillage or in grass. The average size of the farms is about 150 acres, and in point of management and productiveness they will probably compare not unfavourably with any others in the kingdom.

The Judges appointed by the Council were Mr. J. B. Ellis, of West Barsham, Norfolk, and Mr. J. P. Terry, of Berry Field, Aylesbury. In accordance with their instructions, they purposed to make the first visit of inspection on January 11, but were debarred from doing so by the inclemency of the weather, the ground being covered with snow, and a sharp frost prevailing. On this account the inspection was delayed a fortnight, the Judges arriving at Leamington on January 25, and proceeding to their work the next morning.

The field of labour was pretty evenly distributed all over the county, from Birmingham on the west to the borders of Leicestershire on the east, and from Coventry in the north to Stratford-on-Avon in the south. As might have been expected from the large extent visited, the soil was very variable, ranging from sharp gravel and sand to heavy red clay, the transition from one stratum to another being often very abrupt, and occurring, in fact, in the same field.

On account of the late harvest and the abnormally wet autumn of the previous year, the Judges were prepared to find cultivation in a very backward state, especially on the strong clay and red marl farms, and in this they were not disappointed,

as in many instances the autumn wheat had not been planted and some of the stubbles awaited ploughing.

The second visit was paid in the first week of June, when, thanks to the pulverising effects of the frost and the dry spring, there was a good plant of spring-sown wheat, which was of a good colour and promised to make a fine crop. On the fallows which had been sown with turnips there was generally a good plant, and where beans had been planted the straw, though short, was well covered with bloom, and, with a fair season, looked like giving an average yield.

Owing to the enforced lateness of the sowing and their consequent inability to cope with the severe weather, the winter beans, which were a good plant on our first visit, had succumbed, and their place had been supplied with maple peas. The early peas, too, had suffered in the same manner, and those that escaped the frost had been eaten by the pea-weevil, which necessitated a second planting with a later variety.

From the great facilities for transit offered by the numerous canals in this county, many of which run through or by the sides of the farms, the refuse manure of Birmingham, which is to be had in almost any quantity at the rate of 6*d*. per ton at the canal side, can be very easily utilised as a dressing for potatoes, turnips, and other crops. From 40 to 60 tons per acre are often used. In many instances, too, owing to the proximity of the farms to other large towns, a good supply of stable manure is to be had. With the opportunities thus available, the application of ammoniacal and phosphatic manures is rendered almost unnecessary, except in the case of the mangel and turnip crops, and on these a small dressing of from 2 to 4 cwt. per acre of special turnip and mangel manure is employed in addition to the refuse and dung. The Warwickshire farmers have, however, great faith in the manurial properties of soot, 5 to 8 cwt. per acre being employed as a top dressing for wheat, oats, and the like.

The drought of April and May had told very severely on a great many of the fields on the gravelly soil, and in some instances even on the clays, notably on the oats and clover. Some of the latter were completely scorched up, promising but a very light crop for cutting. The permanent grasses, many of which, on account of the backward spring and shortness of keep, had had to be fed till the first week in May, were so thin as hardly to afford cover for a mouse, and gave prospects of the lightest crop that had been grown for years.

Very large crops of mangel were noticed on most of the farms. In the case of swedes it was the exception to see a good yield. This may be accounted for by the peculiarity of the

season of 1891, as many of the fields had to be sown two and three times owing to the ravages of the turnip fly.

Most of the land in Warwickshire is well adapted for the breeding and fattening of sheep. Nearly all the lambs bred, with the exception of the ewe tegs, which in most cases are retained for making up the flock, are fattened out within the year and sent to the different repository sales in the county, in the months of February and March, in their fleeces. This practice has gained favour during the last three or four years on account of the low price obtainable for wool. As a proof of the great fall that has taken place in the price of mutton since 1876, tegs that were then making 70*s.* to 80*s.* each, are now only worth about 50*s.*—a fall of about 30 per cent. in price.

On very few of the farms was any distinct or pure breed of sheep kept, those most in favour being the Oxford Down or Shropshire, but usually a cross between the two. The lambing season in Warwickshire is generally rather late, commencing in a few instances in the third week in February, but mostly at the beginning of March. Ewes are usually kept during the winter months on the old grasses, with a small allowance of crushed oats and hay. In some parts of the county the haulm of the peas, after picking, is gathered and stacked, and used for foddering the ewes instead of oats and hay, for which it is an excellent substitute, as from 5 to 7 per cent. of peas are left in the straw. The employment of artificial foods is for this reason much diminished. Where the turnips are drawn off, the ewes are folded on the land at night, eating the tops, and being supplied in addition with a portion of hay.

On account of the low price of beef and the growing demand for milk, dairying in Warwickshire has again come into fashion, and instead of beef being principally made as formerly, the two-year-old steers are sold off to be fatted in other counties.

A tabulated statement of all the farms entered for competition, in which full particulars as to the acreage, soil, &c., can be seen at a glance, is set forth on p. 556.

That the courage of the Warwickshire farmer has not been damped by the cycle of bad times through which he has passed is shown by the fact that the entries for this competition are more than five times as large as in 1876, numbering 26 against only 5. The entries were as follows: Class I., 9; Class II., 10; Class III., 7.

The competitors throughout showed the greatest willingness to give us every information in their power with respect to receipts and expenditure. Still, in a great many cases no real

Schedule of Farms Entered for Competition.

Catalogue No.	Competitor	Address	Landlord	Acreage of Farm: Arable	Acreage of Farm: Grass	Soil	Subsoil	Award
				A. R. P.	A. R. P.			
	Class I							
1	Cubberley, E. A.	Moor Hall, Alcester	Sir Wm. Throckmorton, Bt.	178 1 16	117 0 11	Chiefly light	Chiefly gravel	H. C.
2	Grimes, W. H. Jun.	Long Itchington, Rugby	Lord Leigh, Mr. W. A. Canning	235 0 0	214 0 0	Chiefly light loam	Sand, gravel and marl	H. C.
3	Hawkes, Joseph	Bearley Grange, Stratford-on-Avon	Mr. T. Avery	176 3 19	84 2 5	Mixed	Marl and gravel	3rd.
4	Hawkes, R. J.	Newbold Farm, Leamington	Earl of Aylesford	116 0 16	198 2 17	Chiefly heavy	Marly clay	
5	James, John	Whitchurch Farm, Stratford-on-Avon	Mr. J. R. West	173 2 29	148 0 23	Light, clay, and heavy loam	Gravel, clay, marl and pebbles	R. N.
6	Lucas, Ezra	Baginton, Coventry	Mr. W. Bromley-Davenport, M.P.	188 2 0	165 2 0	Chiefly light	Sand and gravel	
7	Palmer, John	Hampton-on-Hill, Warwick	Lord Dormer	218 0 17	162 3 18	Heavy	Clay	1st.
8	Thornley, H. E.	Radford Hall, Leamington	Mr. L. G. Williams, Miss Landor and others	284 2 30	210 1 10	Mixed	Gravel and marl	2nd.
9	Toone, J. P.	High Cross, Lutterworth	Earl of Denbigh and others	306 0 0	312 0 0	Light and heavy	Gravel and clay	
	Class II							
10	Blake, E. T.	Salford Priors, Evesham	Marquis of Hertford	146 3 16	89 3 5	Medium	Gravel, clay and marl	
11	Bourne, George	Drakenage, Kingsbury, Tamworth	Sir Robert Peel, Bart.	81 1 22	93 1 18	Heavy	Marl	
12	Coles, Richard	Offchurch, Leamington	Dowager Countess of Aylesford	122 2 0	111 2 0	Light and heavy	Gravel and clay	2nd.
13	Danby, Philip S.	Offchurch, Leamington	Dowager Countess of Aylesford	107 1 3	101 1 11	Chiefly heavy,	Chiefly marl	
14	Denny, Josiah	Budbrooke, Warwick	Lord Dormer	83 0 27	66 1 5	Heavy	Clay and gravel	1st.
15	Dewhurst, R.	Burton-Hastings, Nuneaton	Mrs. Taverner	80 1 1	127 0 7	Light		
16	Francis, T. F.	Tachbrook, Leamington	Earl of Warwick	124 0 7	64 1 7	Medium	Marl	
17	Pratt, C. A.	Rushford, Evesham	Marquis of Hertford	123 1 15	28 0 5	Medium	Sand and gravel	
18	Reeve, John R.	Lillington, Leamington	Major-Gen. Waller	115 0 0	73 2 0	Clay, loam, sandy and marl-loam	Clay, sand and marl	R. N.
19	Wheeler, Charles	Long Compton, Chipping Norton	Marquis of Northampton	74 3 12	79 0 0	Limestone & loam	Varions	
	Class III							
20	Ibbotson, Robert	Knowle, Warwick	Mr. G. A. Everitt	33 0 36	101 0 0	Heavy	Marl and clay	
21	Meigh, J. E.	Eastern Green, Coventry	Hon. Cecil Irby	45 0 0	77 0 0	Heavy	Red clay	
22	Sansome, George	Salford Farm, Evesham	Mr. J. H. Slatter	70 3 6	30 3 13	Light	Water, stone and red marl	
23	Sill, E. J.	Bidford, Stratford-on-Avon	Marquis of Hertford	41 2 10	9 2 36	Light loam	Sand, brash and gravel	
24	Spencer, A. B. & S. K.	Black Hill, Snitterfield, Stratford-on-Avon	Lady Trevelyan	77 2 35	48 1 5	Light and heavy	Sand	2nd.
25	Thornton, Charles	Curdworth, Birmingham	Lord Norton and others	80 2 0	51 0 0	Light	Sand, gravel and marl	R. N.
26	Willday, Lewis	Dunton, Minworth, Birmingham	Lord Leigh	84 0 28	57 3 5	Marl and gravel	Reddish marl	1st

[All the farms are on a yearly tenancy, except Nos. 3 and 7, which are held on lease.]

method of book-keeping had been followed, account only being taken of sums spent for labour and manures. An exception must, however, be made with regard to the accounts kept by Messrs. Palmer, Thornley, James, Cubberley, and Grimes. The first two of these gentlemen have valuations made every year by a professional valuer, and the accounts were shown in perfect form, contrasting very strongly with the greater number of the competitors.

Before closing these preliminary remarks, we must express the great pleasure we experienced on finding that the old good feeling of confidence between landlord and tenant is still very strong in Warwickshire. Many of the competitors have spent large amounts of money on the improvement of their farms and premises, with only a yearly agreement to fall back on, and no clause in this giving compensation for the money thus expended.

Class I.—First Prize Farm.

Occupied by Mr. John Palmer, Hampton-on-Hill, Warwick.

To Mr. John Palmer belongs the honour of having gained the chief prize for farms offered by the Royal Agricultural Society of England in 1892.

His farm, which he holds under Lord Dormer, stands, as its name implies, on a hill, overlooking a beautifully wooded valley about two miles from Warwick, and fronting the majestic old Castle, which stands (embowered with magnificent and stately trees) on a rock, the base of which is washed by the River Avon.

It consists of 381 acres, 218 of which are arable and 163 grass land, and has been in the occupation of the family for more than fifty years, Mr. Palmer's father having entered upon the farm in 1839. The surface soil is heavy, with a clay subsoil, and the land is, as nearly as possible, absolutely "clean," and in making use of this expression we are not only referring to twitch, but also to annual weeds. In fact, the extraordinary absence of weeds of every description was the "feature," so to speak, of this farm.

The fences were beautifully kept, and where gaps had occurred they had been filled up by reaches of iron fencing. Many hundreds of yards of quick fences had been raised, and, by their strong growth and thickness, showed the care and attention that had been bestowed upon them. It is only right to mention that these had all been planted by the tenant and his father at their own expense. In many places the old fences had been stubbed up, and their place supplied by iron fencing.

Plan of Mr. John Palmer's Farm at Hampton-on-Hill.

N.B.—The fields shaded in the plan are grass land.

Names of Fields.

	a.	r.	p.
1. Brick Hill Field	14	3	23
2. Big Hill	18	1	15
3. Withy Comb Pits	12	0	30
4. Lane Close	26	3	0
5. New Close	13	3	0
6. Back Side (a)	18	2	0
7. Home Close, Wisicks, and Calves Close	16	3	12
8. Barn and Yard	0	1	4
9. Farmhouse, Homestead, Garden, and Yard	0	3	36
10. Green Hill and Rick Yard	2	1	0
11. Stable Close	2	2	20
12. Back Side (b)	12	1	34
13. Hilly Close	5	1	25
14. Long Meadow and Moor Field	13	2	0
15. Church Bridge, Moorside Field, and Lay Ground	23	2	24
16. Moor Hill	12	1	32
17. Barn Field, Barn and Yard	22	1	6

	a.	r.	p.
18. Big Cole Croft	12	3	7
19. Finger Post Close	16	0	30
20. Little Post Field	2	3	15
21. The Font Barn and Yard	14	1	30
22. Withy Meadow	16	1	20
23. Imbery Hill; 24. Mare Pit Close } now in one field	17	2	10
25. First Ground	10	2	10
26. Barn Close	19	3	0
27. Imbery Meadow	4	1	4
28. Lower Ground and Close at bottom of Lane	18	2	7
29. Sow Meadow	4	2	0
30. Cold Croft	4	0	6
31. Hoery Close	3	3	21
32. New Close	8	0	24
33. Church Path	10	0	0
	380	3	35

The total length of this is 2,160 yards. All of it has been put down by the tenant, and about half is his own property.

The buildings, which are situated near the house, are commodious and well built. The piggeries are very convenient and substantial. The yards are surrounded by sheds 18 feet wide, and the cow-houses afford accommodation for fifteen to twenty cows, with convenient cutting houses, cake house, and mixing house adjoining, the pulping, cake-grinding, and chaff-cutting being done by horse-power. The whole of this large range of buildings, with the exception of the barn and granary, were built by Mr. Palmer's father at a cost of 1,300*l.* The cart and riding stables, which are on the opposite side of the road, are fully equal to the requirements of the farm. Guttering is carried all round the buildings, and by this means a large quantity of rain water is collected in an underground tank, whence it is pumped up to supply the stables, cow-sheds, &c.

The beautifully kept stack-yard, as well as the scrupulous neatness of the yards adjoining, show that Mr. Palmer's "bump of order" is well developed. An off-yard and sheds are placed in the south-west section. This is a very convenient arrangement, and saves a great deal of carting.

The farm is not very compact, for, as can be seen by a glance at the plan on page 558, it is intersected at many points by other and smaller holdings. The grass land, however, lies well round the house.

It should be mentioned in passing, that a field on this farm was reserved for the Society's plough trials, and was for that reason in stubble at our first visit; but in June we found that it had been partly sown with mangel, which were a first rate plant, and looking well. Another portion was cropped with oats, which promised to be a good crop.

The farm was formerly held on lease, but Lord Dormer, on account of the great depression in prices of agricultural produce, cancelled this, and gave the tenant a substantial reduction in rent.

No particular system of cropping is followed. A large amount of stock is kept and very little hay or straw is disposed of, the sales from that source only amounting to 25*l.* for the year. On the other hand, the expenditure in cake was about 260*l.*, and for corn 120*l.* for the same period. The productiveness of the farm is thus well maintained. In addition to this, the sum of 56*l.* was spent in manure, including artificials.

The permanent grasses, with the exception of those shut up for mowing, are fed off by the ewes and lambs and horned cattle,

This grass land is mostly of good quality, and about 40 to 50 acres are cut for hay annually.

Horses.—Eleven working horses are kept, six being mares. These are good useful animals in fair working condition, and looked as if they were kept for service and not for show. The ploughing has all to be done with four horses at length, the land being very heavy. This will account for what would seem rather a large number of horses for a farm of this size. From the backwardness of the season these animals must have had a hard time of it in the spring, to have got rid of the consequent arrears of work so well. Still, they had been well looked after, and maintained their condition. They were still being fed in the stables on hay and corn at our June visit, the very dry weather having caused a great shortness of keep. Mr. Palmer had in addition two three-year-old colts and a hackney.

Cattle.—From twelve to fifteen cows are kept. They are a cross between the Shorthorn and the Hereford, three crosses of the Hereford being first taken, and then these crossed back by the same number of crosses of Shorthorns. After this it goes on to one cross of Hereford, which leaves the herd at the present time one cross of Hereford to three of Shorthorn. The results of this system appeared to be most satisfactory, for the cattle all showed characteristics of the Hereford strain as far as wealth of flesh and fattening qualities are concerned, and had also retained all the milking points of the Shorthorn. In fact, we were very much impressed by the way in which the distinctive qualities of both breeds had been retained by careful management. The bull which is now in use is a very good Shorthorn, one of the long, low, and wide type, and calves by him were a nice lot. Mr. Palmer had been unfortunate, prior to our first visit, in having a great deal of abortion among his cows.

No milk is sold, but butter is made and disposed of at Warwick and Leamington at an average of 1*s.* 1*d.* per lb. all the year round, the skim-milk being used for rearing calves.

At our first visit, which took place in February, the number of cattle was eighty-three, made up as follows :—

12 cows in-milk or in-calf.
7 heifers in-calf two years old.
6 feeding steers ready for the butcher.
10 feeding cows and heifers.
4 two-year-old steers.
15 two-year-old stirks, served or for service.
22 yearlings.
6 weanlings.
1 Shorthorn bull.
—
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The feeding heifers and steers were having about $1\frac{1}{2}$ bushels of pulped roots mixed with straw and hay chaff, together

with 6 lb. of mixed meal and linseed cake. The cows were receiving a small proportion of roots with hay and straw chaff, and 3 lb. of meal each. Seven heifers in one yard were being fed on long hay, and 4 lb. of palm-nut cake each. The stirks and steers were getting pulp and chaff, and about 2 lb. of cake a day. At the off-barn ten stirks were feeding; these were for going on the grass, and were having oat and barley straw, 3 lb. of linseed cake, and two or three swedes a day. They were a very nice lot, and looked healthy and in good "going on" condition for turning out. At our second visit there were eighty-six head of cattle of all grades.

Sheep.—The number of sheep on our first visit was 348, divided as below:—

131 ewes.	96 ewe tegs.
11 ewes with 16 early lambs to sell fat.	3 rams (Shropshire).
16 lambs.	348
91 wether tegs forward in condition.	

The ewes were a very nice bred lot of Shropshires, showing size, and in good breeding condition. They were being fed on the grasses, and were having about one quarter of a pint of oats and some hay each. The tegs, both ewe and wether, were well-bred, but, on account of the very wet autumn, were not so forward as they would have been in an average season. In fact, the soil was clinging to their fleeces in the most affectionate manner. They were having cut swedes and clover hay *ad lib.*, the wethers getting in addition about $\frac{1}{2}$ lb. of mixed cake. It was noticed that the ewe tegs were the better grown, but this was accounted for by the best or early wethers having been sold in the summer as fat lambs.

Lambing began in the first week in March, and the ewes appeared to have done fairly well, between thirty and forty having dropped twins. The latter were having about $\frac{1}{2}$ to $\frac{3}{4}$ lb. of mixed cake per day, in addition to their usual food. Without going into particulars, we may mention that the number of sheep on the farm on June 6, the day of our second visit, was 484.

Pigs.—Five sows, a very good cross between the Tamworth and Yorkshire Middle White, are kept, and their produce is fatted off. They are fed on skim-milk. The pigs numbered twenty-nine at our first visit, and twenty-five at our second.

Poultry.—Mr. Palmer rears a large quantity of poultry, for which he finds a ready sale at Leamington and other towns. They appeared to be a nice lot and well cared for. The numbers at our two visits were 220 and 350 respectively.

Wheat.—The wheat grown occupied about 57 acres. One field of 19 acres, being after beans, was not sown on our first visit, but had been sown in the spring with Golden Drop at $2\frac{1}{2}$ bushels per acre, and promised to be a magnificent crop. One field of 13 acres, sown after turnips and mangel, was looking very healthy with the exception of a few patches, which were rather scorched up with the drought. This is now laid down with seeds for a three years' ley. The seeds were up and a good plant. Another field of 13 acres had rather lost plant in a few places since our first visit, but it now looked a good colour and strong. After one year's ley, the remaining field of 12 acres is a beautiful plant, and promises to yield excellently.

Barley.—A field of 22 acres has been sown with barley (one part after turnips fed off, the other part after oats); the latter promises to make a nice standing crop, but the former looks too luxuriant, and unless fine weather supervenes most of it must go down.

Oats.—Twenty acres of a field of 28 acres had been left for oats, and had been dressed at the rate of 7 tons per acre with lime compost; but on account of its having to be kept for the plough trials, only about 10 acres of it were sown with this crop. The other 10 acres were left for white turnips, and the rest of the field had been sown with mangel, with the exception of about 2 acres, which were planted with cabbages.

Other Crops.—About 23 acres of spring beans are this year sown on barley or wheat stubbles, having, previous to sowing, been dressed with 15 tons of good farmyard manure per acre. These were now well in flower, and though rather short in straw, looked like making a good crop.

Two acres of mangel were a very fine plant, and were ready to be singled out on our second visit. Ten acres were ready to be sown with swedes, and there were three acres of spring tares, either for feeding or mowing, as might be required.

Thirteen acres of seeds which were to be mown for hay looked like cutting a large crop for the season. The mixture used per acre was as follows:—

2 to 3 gallons Italian rye-grass.	2 lb. white clover.
6 to 8 lb. red clover.	3 to 4 lb. alsike.

In concluding our remarks upon this farm, we ought to say that Mr. Palmer was most anxious that it should be known that he attributes his success in a great measure to the care and attention bestowed on the farm by his late father. While

recognising with pleasure Mr. Palmer's filial affection and modesty, we think that he, too, has had a large share in bringing about what is to him doubtless a most gratifying result, for we consider him not only a first class farmer, but a thorough man of business. No extra expense had been incurred by Mr. Palmer either in manure or labour to get his farm into what may be called "Show order."

Class I.—Second Prize Farm.

Occupied by Mr. Henry E. Thornley, Radford Hall, Leamington.

The second prize in Class I. has been awarded to Mr. H. E. Thornley, who occupies 495 acres of land, made up of two holdings called respectively the Radford Hall and Radford Barn Farms (the former held under Mr. L. G. Williams, and the latter under Miss Landor), and about 20 acres rented from small proprietors. There are 285 acres of arable land and 210 acres of pasture.

Radford Hall, which is situated about a mile and a half from Leamington, came into the occupation of the present tenant in the autumn of 1887, and the Radford Barn Farm two years later, both farms being held upon a yearly tenancy. This differs from the first prize farm in being more particularly a dairy farm. Mr. Thornley, in entering into occupation, which was at a time when the prices of agricultural produce were extremely low, determined to open up a new line and to depart from the ordinary routine of farming. He considered there was a good opening for the sale of milk, cream, and vegetables at the neighbouring town of Leamington, and being quick to seize an opportunity, he embarked in this business, determined to use every effort to make his venture successful.

He has now established a fine wholesale and retail trade, the milk of fifty cows being distributed daily. The herd is principally Shorthorns, chosen more for their milking than for their beef-producing properties, though the latter has not been quite left out of the question. A few Jerseys and crossbreds are also kept to improve the quality of the milk. One half of the herd is selected and put to the bull at any time of the year. The heifer calves from them are brought into milking at three years old. The bull calves are mostly disposed of at once, with the exception of one or two bred from an exceptionally good milking strain. These are kept on for use as Mr. Thornley may require them. Liberal feeding is adopted, and all discarded cows are sold as beef.

Seeing that the preparation of food for so large a herd was

a very serious consideration, Mr. Thornley has found it necessary, in order to economise time and diminish expense (the existing buildings being quite inadequate), to erect a large building with the requisite machinery at his own cost, with the consent of his landlord, and on liberal terms in the event of his severing his tenancy. A range of shedding has been built 121 feet long and 24 feet 6 inches wide, in which hay and straw can be stored in large quantities. There is also a six-horse Tangye Cornish boiler and a fixed horizontal engine, with the usual shaftings and connections. This drives a Maynard's chaff-cutter, a pair of Derbyshire stones, a Barford and Perkins grist mill, with elevator to same, root cleaner and pulper, cake crusher, and dressing machine, with elevator and weighing machine combined. Supplied from the boilers by underground pipes are chaff chambers, mash steamers, water furnaces, pig-food steamers, &c. Particular care is given to the thorough cleaning and steaming of milk churns and other dairy appliances. This has been done at a cost of 800*l.* Mr. Thornley, in the course of the summer, when brewers' grains are cheap, enters into a contract for the supply of about 10,000 bushels of this article. These are stored in a silo and kept for use in the winter season, when, mixed with cut straw, hay, and a few roots and meal, they form the principal food of the cows—three feeds daily being given. They have a little long hay at night. The cows intended for the butcher have an additional supply of linseed and cotton cakes. These are kept in the sheds all the year round, getting green vetches and clover carted to them. The cost of purchased foods, including grains, amounts to the large sum of 1,200*l.* About fourteen heifer calves from selected cows are reared annually.

Twenty or thirty acres of peas are grown for picking for market, the varieties grown being First Early Eclipse or Improved Leicester Defiance, the Prince of Wales, and the Ne Plus Ultra for latest. Ten acres are devoted to other garden produce, for which a good demand is maintained. The advantage of daily delivery direct from the farm to the shops is most convenient to purchasers; and the vegetables being in a fresh condition, best prices are obtained.

Of course, the carrying on of these two branches of the business necessitates the expenditure of a large amount in labour, the bill for which has grown from 800*l.* in 1889 to 1,300*l.* in 1891, but the sales of milk and vegetables have increased in the same period from 2,100*l.* to 3,000*l.*

At various times during his tenancy, as opportunity has occurred, Mr. Thornley has reclaimed from the sides of his

fences (including some rush land converted into osier beds) a total area of four acres. All fences and gates are in excellent condition.

Horses.—Fifteen cart horses are kept for working this farm. These are of a very useful description and in good condition, many of them possessing a good deal of the blood of the Shire horse, although not eligible for the Stud Book. Several young hunters and hackneys were seen running on the grass, and looked like growing into useful animals. Two milk-cart horses are kept, and one horse for the vegetable cart.

Cattle.—At our first visit these numbered 102, namely :—

58 milch cows.	4 steers.
10 cows in-calf.	9 calves.
18 heifers.	3 bulls.

Their breeding has been described in a previous paragraph. At our second visit the numbers were almost exactly the same, but several of the heifers were now in-calf, and the total amounted to 105.

Sheep.—The ewes, 130 in number, are of the pure Shropshire breed, and were in good condition, feeding on the grass, and having about a quarter-pint of crushed oats per ewe. One hundred and seventy tegs of mixed breed were having cut roots and $\frac{3}{4}$ lb. of cake per day. Fifteen fat sheep were ready for the butcher. Sixty of the forward tegs had been sold out fat before our second visit.

Below are lists of the sheep at our two visits :—

First Visit.		*Second Visit.*	
Ewes	130	Ewes	90
Tegs	170	Lambs	124
Fat sheep	22	Fat tegs	100
Rams	4	Unshorn	10
		Tup	1
	326		325

Pigs.—Ten breeding sows are kept of the Yorkshire Large White breed, and 107 pigs of all ages up to 5 months old were fed for pork and sold at the local markets.

No regular rotation of cropping is followed on this farm, the tenant taking a catch crop whenever available on land lying near the homestead or abutting on a canal. This is done in order that the land can be recouped for the extra crop by the supply of a large quantity of manure. That which is farther away and awkward-working land has been laid down by Mr. Thornley during the last three years, and looks like making

useful grass. It was laid down with the following mixtures:—

One year's ley:—15 lb. red clover, and $\frac{3}{4}$ peck Italian rye-grass per acre.

Two years' ley:—5 lb. English red clover, 5 lb. cow grass, 2 lb. white Dutch clover, 2 lb. alsike, 2 lb. trefoil, $\frac{1}{2}$ peck Italian rye-grass, $\frac{1}{2}$ peck English permanent rye-grass per acre.

Renovating mixture:—4 lb. cow grass, 4 lb. white clover, 2 lb. alsike, 2 lb. trefoil, 1 lb. timothy, 2 lb. cocksfoot, 2 lb. mixed fescues, $\frac{1}{2}$ lb. sweet vernal, 1 lb. crested dog's-tail, $2\frac{1}{2}$ lb. English permanent rye-grass per acre.

About 330 tons of town manure, costing 83*l.*, making with soot, 12*l.*, and turnip manure, 60*l.*, a total outlay of 155*l.*, have been used on the farm during the past year.

Wheat.—The area under this crop is 46 acres, all of which, with the exception of one field, was sown in the autumn. It is looking well and strong, and promises to be a first rate crop. The field which was sown in the spring was after a crop of peas. The peas were cut and carted off, the field was then ploughed up by steam, a crop of cole seed sown, which was fed off by sheep in the autumn, and in June a splendid crop of wheat was growing.

Barley.—This crop is also 46 acres in extent, and, taken as a whole, was looking very well, but not quite so free from annual weeds in some places as could be wished.

Oats were planted on 34 acres. Twenty-two acres were sown after mangel and potatoes, and generally were a very good crop, but were a little injured by the drought in some places. They were not quite free from weeds. Seven acres after white turnips were a very fine crop. The 5 acres in the Hovel Close were rather thin, but looked strong and healthy, and likely to give a fair yield.

Potatoes occupied 21 acres. These were dressed with 15 or 16 tons of good muck. They were up well and nicely clean.

There were 21 acres of *Vetches*, 13 acres of which had been sown in three relays, to be fed off or mown as wanted in the summer. The first of these sowings had been attacked by weevil, and on that account was much more backward than it otherwise would have been. There were a few pieces of twitch on this field. The other 8 acres were grown for feeding off by sheep having cake.

Peas.—The early peas had been taken off by the pea-weevil, but the land had been planted again with Prince of Wales, and looked like yielding a fair crop.

Other Crops.—The mangel (about 9 acres) were a very good plant, and just ready for singling. These get about 16 tons of farmyard manure and 3 to 4 cwt. of mangel manure per acre. About 8 acres of green-top turnip had been sown for early feed, and were a very regular plant. Some swedes had been put in and were just coming up. They were some 18 inches apart in drills, and had been manured with about 12 tons of muck per acre and 2 cwt. of special turnip manure. The rest of the ground was manured in the same manner, and was being got ready to plant as soon as possible. Several of these fallows were not so free from twitch as we could have wished.

Eighty-five acres of seeds, part of which is one year ley, were being saved for mowing; it is rather variable in the different fields, in some instances promising a very good crop, and in others rather thin. The remainder, consisting of two and three years' ley, was being grazed.

The pasture is rather variable, some of it being very good grazing land, but on the lighter or thinner soil only of medium quality.

A canal runs through the farm, and at a wharf on this, close to the engine house, coals are delivered.

In concluding our remarks on this farm we think it only right to mention that Mrs. Thornley, who is a wonderful business woman, takes a large share in the management of the retail business, and keeps all the accounts in a very clear manner.

Mr. Thornley is on excellent terms with his labourers, who last year subscribed for a marble dining-room clock, which they presented to him as a mark of appreciation of his kindness to them.

Class I.—Third Prize Farm.

Occupied by Mr. Joseph Hawkes, Bearley Grange, Stratford-on-Avon.

The Third Prize in Class I. has been awarded to Mr. Joseph Hawkes, whose farm lies within 4½ miles of Stratford-on-Avon, and about eight minutes' ride by rail from that place. The station, which is the second from Stratford, is only about three minutes' walk from the house.

The farm consists of 177 acres of arable, and 44 acres of grass, held under Mr. Thomas Avery on lease, two years of which have still to run. On account of the bad times, Mr. Hawkes has been allowed 25 per cent. reduction in his rent. There is no doubt that Bearley Grange has been very much improved during the ten years' occupancy of the present tenant. So clean

is it, that it was almost impossible to find a piece of twitch on the farm. The other 40 acres of grass, which are about 1½ mile from the farm, are his own property. Nearly all of this has been laid down by Mr. Hawkes within the last ten years. There is a good bottom, and it looks like coming into very useful grass, free from thistles and nettles, showing that a good deal of attention has been paid to this matter by the owner.

It is a mixed soil, ranging from strong marl to sharp gravel. A six-course system of husbandry is generally pursued on this farm, and is as follows, though sometimes departed from: fallow or turnips, wheat, seeds, wheat, beans, wheat, or barley. The tenant has found it advisable in some parts of the farm to leave a dead fallow now and again, as the seeds plant so much better in the wheat which follows.

The seeds consist of the following mixture :—

5 lb. red clover.	5 lb. Dutch or white clover.
5 lb. alsike.	5 lb. trefoil.

½ bushel of Italian rye-grass.

We looked upon this as a very heavy seeding of the clovers, but were assured that excellent results were always obtained.

The fences all over the farm were in beautiful condition, very clean and well-kept. The gates were hardly in so good a state of repair.

The homestead, which is commodious, and good for the size of the farm, adjoins the road to the village, and is conveniently situated for the land, most of the grass lying round the house. The buildings are fairly good, with just enough accommodation. In the stack-yard a Dutch barn, 20 yards long, 12 yards wide, and 18 feet high to the eaves, had been erected by the tenant. An off-barn and yard are situated on the far side of the farm, and economise in a great degree the carting of manure, &c.

The arable land nearest the house on both sides is in fine condition, free from weeds, and not a piece of twitch to be seen. In fact, most of the fields were as clean as a garden. On the farther or Stratford side, the lands run to strong marl. This is nasty working land, some of it being so poor that Mr. Hawkes has been obliged to lay it down in grass; and though he has managed to get a fair sward, about one sheep per acre is all it is capable of keeping. These are as free from weeds as the better part of the farm.

The grass lands before mentioned are of very useful quality, but not good enough to graze either sheep or bullocks without the aid of cake, which article is used with no sparing hand. No account being kept, we could not get at any reliable data of the amount expended for artificial foods.

Horses.—Seven working horses are kept. These looked a hardy, useful lot of farmer's horses.

Cattle.—The cattle consisted, at our January visit, of fifty-five head, half of which were bred on the farm; eleven heifers were being fed in boxes on 10 lb.of Bibby's cake, one gallon bean meal, one bushel of swedes, and hay *ad lib.*, and were quite ready for the butcher. They were a beautiful lot of animals. Six cows, nearly pure Shorthorns, are milked for the purpose of making butter. The remainder were being kept in a healthy "going on" condition for being turned on to the grass in the spring. These were having about 6 lb. of linseed cake per day on the grass at our second visit. They had not done so well as we expected, and a good many of them were lacking in quality.

Sheep.—At our first visit the sheep numbered 114. Forty-nine cross-bred shearling Shropshires were being fed on cut turnips, with $\frac{3}{4}$ lb. of linseed and Bibby's cake mixed per day. These were quite ready for the butcher, and were sold before our second visit. Fifty-five cross-bred tegs were on the grass, and were having $\frac{1}{2}$ lb. of mixed cake per day. At our second visit we found 340 tegs which had just been shorn; they were feeding on the different grasses, and getting about $\frac{3}{4}$ lb. of Bibby's cake. One lot of eighty were having cut mangel on the grass, and 1 lb. of cake and beans mixed. The whole of these were a very fine lot of cross-bred sheep; they had been bought well, and looked like making a fair return. No sheep are bred on the place. This was formerly done, but the loss was so great that it had to be given up, and it is now found better and more profitable to graze sheep than to breed them.

Pigs.—Twenty-five to thirty pigs are generally kept. These are bought in at from 1*l.* to 30*s.* each, and fatted out. They are mostly of the Large White breed. Mr. Hawkes has gained several prizes for fat pigs at the local Christmas shows.

The corn crops on this farm on our June visit were looking exceedingly well, with the exception of a field of wheat on the stronger land, which had lost plant in places, but it was of good colour, and very strong in the straw. Altogether, the crops generally were looking well, and like coming to a large yield. Mr. Hawkes, when he first came to Bearley Grange, used a great deal of Birmingham refuse, but has now discarded it, being a strong believer in well made muck.

The *Wheat*, which is the principal corn crop grown on this farm, with the exception of the field mentioned above, was a good plant, and looking remarkably well.

Very little *Barley* is grown. One field of nearly 9 acres,

after wheat stubble, and heavily dressed with farmyard manure and 5 cwt. of superphosphate, was a very level crop, and all that could stand on the ground. There was scarcely a weed to be seen in this field.

A field of 15 acres, after swedes and mangel, was sown with Webb's black Tartarian *Oats*. These in some places had been a little scorched with the drought, but as a nice rain had fallen the night before our visit, were not too far gone for recovery, and, with an average season, looked like making a fair crop. The oats where the swedes were fed off looked much better than where the mangel had been grown. We were of opinion that had a top dressing been applied to this part, it would have well repaid the outlay. This was now laid down with seeds, which were showing a thick plant. More annual weeds were seen in this field than on any other part of the farm, although it had been hoed twice before the seeds were sown.

Fourteen acres of spring *Beans* were sown after wheat stubble, having had a liberal dressing of farmyard manure. These were exceptionally clean, well in flower, very healthy, and calculated to yield well.

A small field of maple *Peas* looked extremely well, and would make a heavy yield if they did not run too much to straw. We noticed that none of the late or hardier peas had been attacked by the pea-weevil. In walking through this field no weed of any description could be found.

Seeds are a very thick plant, and were all saved for mowing, Mr. Hawkes depending solely on this source for his stock of hay.

Mangel was rather a thin plant, having, like most other crops of mangel seen on our visit, been attacked by the maggot. The crop was being hoed, and was very free from weeds. It had been dressed with farmyard manure, and 6 cwt. of mangel manure per acre, costing 7*l.* per ton. The seed was sown 18 inches apart in the drills.

The *Swedes*, which were just out of the ground, were sown 24 inches apart. They were a good plant and very free from weeds. These had 3 cwt. of the same artificial manure as the mangel, and about 10 tons of farm-yard manure per acre.

A row of *Potatoes* about 250 yards long is given to each labourer on the farm. The man plants the potatoes, and Mr. Hawkes manures and ploughs the land, and keeps it clean.

Class I.—Reserved Farm.

Occupied by Mr. John James, Whitechurch Farm, near Stratford-on-Avon.

This farm, situated about $3\frac{1}{2}$ miles east of Stratford-on-Avon, is held on a yearly tenancy from Mr. J. R. West, of Alscot Park, and consists of 173 acres of arable, and 148 acres of grass land. This might be termed a mixed soil farm, ranging from a very fine loam to a heavy, bad-working marl. It is most compact, lying all round the homestead in a ring fence, the grass lands being in the centre, and it has been in the occupation of the present tenant only about three years. It can be seen by the appearance of this farm that Mr. James has spared no expense to make it one of the best farm-holdings in the county. Hedges have been laid, borders grubbed up, and improvements made wherever needed. New fences have been planted where bad ones formerly stood, and, where near grazing grounds, have been protected by railings on both sides.

The buildings are well constructed, conveniently planned, and fully adequate to the requirements of the farm. The sheds are good and wide, but the yards are small.

No hay or straw is allowed to be sold from this farm, nor are any potatoes allowed to be grown thereon.

Horses.—Ten working horses are kept, all young, and one mare eligible for the Shire Horse Stud Book. All the horses are bought at three or four years of age, and worked on the farm till six years old, when they are sold. Mr. James had been so unfortunate as to have his horses attacked by influenza in the interval between our first and second visits.

Cattle.—No cattle are bred on this farm. At our first visit, the stock numbered sixty-three, being a cross between the Hereford and Shorthorn. They were in good condition. Some of these had been sold in the interval between our visits, but twenty-five extra bullocks had been bought, so that in June the number was eighty-three. These were now feeding on the grasses, and cost about 16*l.* 10*s.* each near the middle of May. Nineteen were being fed on cake at the rate of about 6 lb. per day each, and were a grand lot of cattle, weighing from 64 to 66 stone of 14 lb. each, and were waiting for the hoped-for rise in the price of beef before being sold.

Sheep.—On our first visit, 282 sheep were kept on the farm. 121 ewes in lamb, of the pure Oxford breed, were a very nice lot in very healthy condition, and timed to lamb down about March 21. They struck us as being a little too open in the

coat for an ideal Oxford flock. They were being folded on mangel ground, with a small pen of white turnips each day, and long hay at night. Fifty ewe tegs, for making up the flock, were eating turnips, and having long hay and ¼ lb. each of meal, mixed with cut clover. We considered these rather small in feature, and not quite up to the average quality. 101 wether tegs in two lots were having ½ lb. of Bibby's cake per day, with cut swedes and long hay. Several of these sheep were very lame. Ten shearlings were ready for the butcher.

On our second visit, we found that the wether tegs had all been sold in March at an average of 48*s*. 6*d*. each. Fifty ewe tegs had done very well, were well grown, and had made more improvement than we expected. These were now having a pen of vetches a day. The ewes and lambs had done very badly, there being only 137 lambs from 121 ewes; the former had just been weaned, and put on vetches. These, though nicely bred, were very poor and stunted. Mr. James thought the reason for this was that the old grass was too strong for them.

No fixed system of cultivation is followed on this farm. The *Wheat* crop, with the exception of one field on the awkward land, which had lost plant a good deal and was very twitchy in some places, is a fine crop, but not so free from thistles and weeds as might be wished.

The *Barley* (Goldthorp) sown, two bushels per acre, 9 inches between the drills, was planted partly after swedes and turnips fed off with the sheep, partly after mangel, the ewes being folded on the mangel land. It has been hand-hoed and sown with seeds, and is a very fine crop, and unless fine weather follows will all be down.

Oats.—These were Oakshott's White Victoria, at 2½ bushels per acre after turnips fed off, and were stout in the straw, but of good colour, and calculated to make a fine crop. They had been hand-hoed, but a good deal of scratch grass [1] was still left, especially in the drills.

The *Beans* were sown on a barley stubble. Only a part of this was mucked with about 12 tons per acre, the other part having nothing done, as a crop of swedes had been fed off two years previously. They are sown 22 inches apart, and 3½ bushels per acre. These were not quite so good as we expected to find them, but no difference could be detected between the manured land and the other.

[1] This is the plant variously known as goose-grass, hariff, whip-tongue, cleavers, &c. Its systematic name is *Galium Aparine*, L. (natural order Rubiaceæ).—ED.

Peas.—The land on which we found this crop was, on our first visit, planted with winter beans well up, but they were so damaged by the sharp frosts that they had to be ploughed up and a crop of maple peas substituted. These were now looking very well, and were fairly free from annual weeds, but in some places in the field an old legacy of twitch cropped up.

Seeds.—One field of seeds was being fed off by the ewes. This was a very poor plant, showing nothing but rye-grass and a great many weeds. This had been intended for a three or four years' ley, but, being such a bad plant, will not be left. Another field, which was planted with the following mixture, is a very fine crop and looks like cutting 2 to 2½ tons per acre :—

9 lb. red clover.	6 lb. white clover.	3 lb. trefoil.

A field of vetches, which was being fed off by sheep, was ploughed up close to the fold to be planted with turnips. Three acres of cole had been drilled at one end of this field on April 20, and was now hoed out and singled, leaving a first rate plant and very clean. The mangel were a fine plant, hoed out and singled, and very free from weeds, being one of the forwardest and best crops we had seen. They were the only crop not affected with the mangel maggot. Twelve tons of muck and 2 cwt. of mangel manure per acre had been used. About 9 acres of swedes were just up, but had been attacked with fly, and it is a question whether they will be a full plant. These had just been horse-hoed and were very free from weeds.

Grass Land.—Some of the grass land lying by the side of the Stour is very liable to flood; in fact, one meadow, called the Island, is almost dangerous to put stock on, as the water rises so quickly. For this reason that and another meadow, making about 32 acres, are generally left for mowing. The rest of the grass is of first rate quality, and will fatten a bullock, and is equally "kind" for sheep.

In conclusion we would say how much we were impressed with the management of this farm, and we feel confident that, had Mr. James been in occupation for a longer period, he would have run some of the winning farms very closely.

Class I.—Highly Commended Farms.

The remaining farms in Class I., occupied by Mr. E. A. Cubberley, of Moor Hall, Alcester, and Mr. W. Holmes Grimes, Jun., of Long Itchington, near Rugby, were highly commended by the Judges.

Though lying at opposite ends of the county, and farmed

under rather different conditions, they were both well done as to general cultivation of the land and also management. Had not the competition been so keen in this class, these farms must have taken a high position. In fact, any one of the six farms enumerated would have been worthy of a prize in almost any competition.

Class II.—First Prize Farm.

Occupied by Mr. Josiah Denny, Budbrook, Warwick.

Mr. Denny's farm is about $2\frac{1}{2}$ miles east of Warwick. The tenancy is a yearly one under Lord Dormer. The area is 150 acres, 3 roods, 24 poles; about 84 being arable and the remainder pasture. The soil is a very tenacious marl or clay, and extremely difficult to work, four horses at length being required to plough it. The only exception to this is a few acres in one field, which is a sharp gravel on a yellow clay. The farm has been in Mr. Denny's occupation forty years, and during that time many fences have been pulled down and fresh ones planted, many fields being enlarged and the boundaries of others straightened. An absolutely clean farm is very difficult to find, but this approaches as near to that ideal as any that it has been our lot to visit. The seven and nine-course system are followed on this holding. In the seven-course the following is the order: Fallow or turnips, barley, seeds, wheat, beans, wheat, oats. In the nine-course, beans are substituted for oats and the oats are manured.

The farm is bounded on its eastern side by the Napton and Birmingham Canal, and Mr. Denny takes advantage of the facilities of carriage afforded by this means to make use of about 2,000 tons of Birmingham refuse at a cost of 50*l.* An expenditure of rather over 2*l.* per acre for cake, corn, and feeding stuffs keeps up the fertility of the soil.

The farm buildings, stables, &c., are compact and well arranged, all spouted and well drained, and in thorough repair. There is a good cow-house capable of holding six cows, and the yards and mangers all have water laid on.

A large portion of the farm has been drained, the tenant finding tiles and labour.

Horses.—Four horses are kept on the farm. These are a good working team.

Cattle.—Forty-one head of Shorthorn cattle were kept in the yard at our first visit, viz. four feeding cows, five milking cows, one calf heifer, fifteen two-year-olds, twelve calves, and four weaning calves. Both the cows and young stock were a very creditable

lot, all having been bred or reared on the farm, and were in very nice condition. Butter is made, and sold at Warwick or Leamington, and appeared of very nice quality. The Jersey creamer is used, and the dairy and everything connected with it are scrupulously neat and clean. In June we found that four fat cows had been sold and five calves and one heifer bought, which left the stock in the same relative position on both visits. The calves and two-year-olds were turned out to grass, and were having a

Plan of Church Farm, Budbrooke, in the occupation of Mr. Josiah Denny.

little cake—the calves about 1 lb. and the two-year-olds about 6 lb.—daily. Keep had been so short in the spring that Mr. Denny had been obliged to hire about 20 acres of grass keeping, in order to avoid selling off his stock at a sacrifice. The steers and stirks had in our opinion not done so well as we expected, but were a useful lot of cattle, some being forward enough to sell fat off the grass.

Sheep.—These numbered 138, and were of fine Shropshire breed, showing nice quality, fair size, and a very healthy condition. Sixty of these were in-lamb ewes, which were being fed on the grass, with cut hay and $\frac{1}{3}$ pint of crushed

oats each per day. They had lambed down well, the sixty ewes having ninety lambs; four lambs and one ewe had been lost since lambing. There had been no loss during lambing. We thought that it showed exceptionally good management to obtain such excellent results on cold, heavy land. Thirty ewe theaves were on the grass, and struck us as being an unusually fine lot. These were having $\frac{1}{3}$ pint of corn per day. Thirty-one of the wether tegs had been sold in April at an average of 47*s*. each, out of the wool.

Pigs.—Two sows are kept, of the Middle White breed, and these are crossed with the Tamworth, the produce having the refuse milk, &c., and being fatted out and sold.

Wheat, with the exception of one field, where it had lost plant and had been filled in with spring wheat, looked very well. The *Oats* in one corner of a field had suffered a little from drought, but looked like making an average crop.

Barley, of which only a very small acreage is sown, was after turnips fed with sheep, and gave promise of a magnificent yield.

Beans, of which, compared with the size of the farm, a large acreage is sown, looked very promising. These were remarkably free from weeds. One field, although it had never up to that time been hoed, was so clean that we could scarcely find a weed in the whole field.

The crop of *Clover* and *Rye-grass* had evidently suffered from being fed so late, the sheep not having been taken off till the last week in April, and though very thick on the ground was rather short. It did not look like cutting a big crop. This had been sown with 12 lb. of red clover and half a bushel of Italian rye-grass per acre. It had been manured in the winter with about 12 tons per acre of farmyard manure, and was to be cut twice.

Mangel were rather backward, and had suffered much from the maggot, but the ground was very clean and free from weeds.

The *Swedes* were not sown, but the land was nearly all ready for planting. About a boat load, or 25 to 30 tons, of Birmingham ash manure and 2 cwt. of poudrette (a Birmingham speciality) per acre had been used for these crops.

Some of the grass land is low lying, and a part of it is liable to flood. It had been fed with sheep up to the first week in May, and was then shut up for mowing, but looked like cutting a very small swathe. That on the higher ground is of better quality, but nothing like first-class grass.

Class II.—Second Prize Farm.

Occupied by Mr. Richard Coles, Offchurch, near Leamington.

This farm, which gains the Second Prize in Class II., is situated about $3\frac{1}{2}$ miles west from Leamington, and is held on a yearly tenancy from the Dowager Countess of Aylesford. It consists of 122 acres of arable and 111 of grass land.

The soil is principally of a light and gravelly nature, but in one or two fields a strong clay is met with. The six-course system is followed in a somewhat modified form. A large number of sheep are bred and fed, which in some measure accounts for its high state of fertility. Mr. Coles is ably assisted in the management of the farm by his two sons, who are well versed in every detail of the business.

The homestead is at the west corner of the farm, is roomy and substantially built, well guttered, and with good drainage.

Horses.—Five working horses are kept, ranging from three years old to nine, and are a very good and sound lot. A foal or two is bred every year, and thus the team is kept up without any large expenditure.

Cattle.—Fifty-one head of Shorthorn cattle were here, on our first visit, made up as follows:—Nine cows in-milk or in-calf, one feeding heifer, one feeding bullock, eleven two-and-a-half-year-old steers and heifers (ten of these Mr. Coles's own breeding), seven one-and-a-half-year-old steers and heifers, fifteen yearlings, six calves, and one pedigree Shorthorn bull, "Forester," by "Lord of the Forest." These cattle are, with few exceptions, bred on the farm, and all looked in very nice condition. The cows are generally fatted off after they have had the fourth or fifth calf. A little milk is sold at 1*s.* per gallon in the summer, and 1*s.* 4*d.* in the winter; skim-milk making 4*d.* a gallon. Butter is principally made, and this is sold at an average price of about 1*s.* 2*d.* per lb.

Sheep.—Sheep management is one of the strong points on this farm, 267 sheep being kept at our first visit; 116 of these were breeding ewes of a cross between the Oxford Down and the Shropshire, and were of very uniform character, with plenty of size and good fleeces. Sixty-five feeding wether tegs were having sliced swedes and $\frac{3}{4}$ lb. of cake and beans mixed; twelve had just been sent to the sale (February), and brought home 48*s.* each. All of them had been sold before our second visit, part of them out of the wool, at an average of 47*s.* each. One Shropshire ram and one Oxford Down ram are kept. Eighty-four store tegs were eating white turnips, and got about $\frac{1}{4}$ lb. each of beans and

cake, clover stover being given long in the bins. On our second visit there were 116 ewes and 179 lambs, and, up to May 1, none of the latter had been lost, though since then one had died. There was no loss of ewes in lambing, but two have died since; their lambs are, however, alive. One of the ewes in this flock had produced twelve lambs in three years, viz., five, four, three. Of the seventy-eight ewes and cull tegs not one had been lost since August last.

Pigs.—One sow and about fourteen pigs and their produce are kept, and generally fatted off.

Wheat.—One field of Square-head wheat, after four years' turf, being on rather a scaldy piece of land, had felt the effects of the drought severely in some places, but on the other part, where a deeper staple prevailed, a fine crop was growing. Some patches of foul grass were found in this field. The other field was of Reedy Red wheat, sown at the rate of three bushels per acre, part after turf and part after beans, the former looking very well and likely to make a full crop. The latter was a thinner crop, and by no means clean. About four acres of spring wheat after mangel promised well.

Barley.—The barley after swedes partly fed off by sheep was a nice crop, but showed plainly where the fold had been in the very wet weather in the winter. This was laid down with the following mixture of seeds:—14 lb. red clover, 1 lb. alsike, 1 lb. trefoil, 1 peck of Pacey's rye-grass, and 1 peck of Italian rye-grass. These were now well planted.

Beans and *Peas* were very clean, and bade fair to make a good crop. Only a small acreage was planted with *Oats*, and these, being on rather a veiny piece of land, showed the effects of the drought in many places.

The *Seeds* had been fed down with sheep till so late in the season, that, though tight at the bottom, they must cut a small yield of hay.

Three acres of *Mangel*, which were a very nice plant, and free from weeds, were now being singled. These, like all others visited, had not escaped the ravages of the maggot. The *Swedes* were sown on ridges 20 inches apart, and were up well. The white turnips had not been sown.

Grass land.—Round the house the grass land is of very nice quality, but as one gets farther away on the hill, it does not appear so good, though all is very healthy for sheep. The low-lying meadows by the side of the Leam, being liable to flood, are mown every year.

Class II.—Reserved Farm.

Occupied by Mr. John R. Reeve, Lillington, near Leamington.

This farm is composed of 115 acres of arable and 73 acres of grass land, and is held on a yearly tenancy from Major-General Waller. Two-thirds of it is heavy clay loam, and the remainder sandy and marl loam. In driving to it we passed an oak, said to be in the centre of England. This farm almost adjoins Leamington, which makes it very favourably situated for the selling of milk and dairy produce, of which Mr. Reeve is not slow to take advantage. The house adjoins the main road from Leamington to Offchurch. The buildings are of brick and tile, and suitable for the occupation.

A dairy of twenty-three Shorthorn *Cows* is kept, their produce being disposed of in Leamington at a remunerative rate. They are a very useful lot, and care is taken to weed out all bad milkers and replace them with younger cows. About ten more head of cattle were seen on the farm.

About 120 *Sheep* are kept. Fifty of these are breeding ewes of the Shropshire type, and a great many lambs are sold out fat. Several are bought in and sold out again fat as quickly as possible.

One field of *Wheat*, which had been top dressed at the rate of 8 cwt. of soot to the acre, had lost plant and was a very thin crop, but was healthy in colour and fairly free from weeds. The top part of this field, Mr. Reeve told us, had been offered for allotments, but refused on the ground that it was not good enough. Another field seemed like making a nice crop.

The *Oats* and *Barley* were looking very well, but in some places had suffered from drought and did not promise a heavy crop, with the exception of one field, which bid fair to be all that could be wished.

A piece of clean cow-grass was left for cutting, and had the appearance of turning out a good crop. Mangel were hoed out and looking very healthy. The turnips had not been sown at the time of our visit. Some of the grass land is of very poor quality, but nearer the house there is a field or two of useful grass.

Mr. Reeve does some little dealing, and, therefore, the number of stock on the farm, with the exception of ewes, is very variable.

Class III.—First Prize Farm.

Occupied by Mr. Lewis Willday, Dunton, Minworth, Birmingham.

The First Prize in the Third Class was awarded by the Judges to Mr. L. Willday, who holds his farm on a yearly tenancy from Lord Leigh. Its size is 141 acres, 57 being grass and 84 arable; the soil is a poor thin gravel. The tenant and his forefathers have occupied this farm since the beginning of the seventeenth century, and have account-books in their possession going back to that date. The buildings are exceptionally good and convenient.

The Birmingham and Fazely Canal runs through the farm, and by its means large quantities of manure are brought from Birmingham, and delivered at the farm at 6*d.* a ton. At the time of our visit about 750 tons of this refuse was lying in one heap, waiting to be carted on the land as time permitted. This was to be covered with 50 tons of "pan" manure at a cost of 3*l.*

Four working *Horses* are kept, and a foal or two generally bred every year. They are a useful lot of young horses.

Thirty-eight *Cattle* are maintained: five milking cows, nineteen one-and-a-half-year-old steers and heifers, and fourteen calves. These are all Shorthorns, bred or bought in as calves, and reared on the farm. Nine two-year-olds had been sold since our first visit at 12*l.* each, and three calves had been bought and three bred. These were a very nice lot.

Sheep.—Twenty-nine ewes in-lamb, a cross between Oxford and Shropshire, were very big and of a nice character. Of forty-four tegs, ten had been sold (five clipped and five in the wool), averaging 61*s.* each—a good lot of sheep, as the price will testify. Twenty-seven of the ewes had lambed down forty-eight lambs, one ewe having lost her lamb, and another being barren. These, at our second visit, were with the thirty-four tegs, and were having 1lb. of cake, and were ready for sale at any time. In fact, we were of opinion that they were getting almost too good for the hot weather.

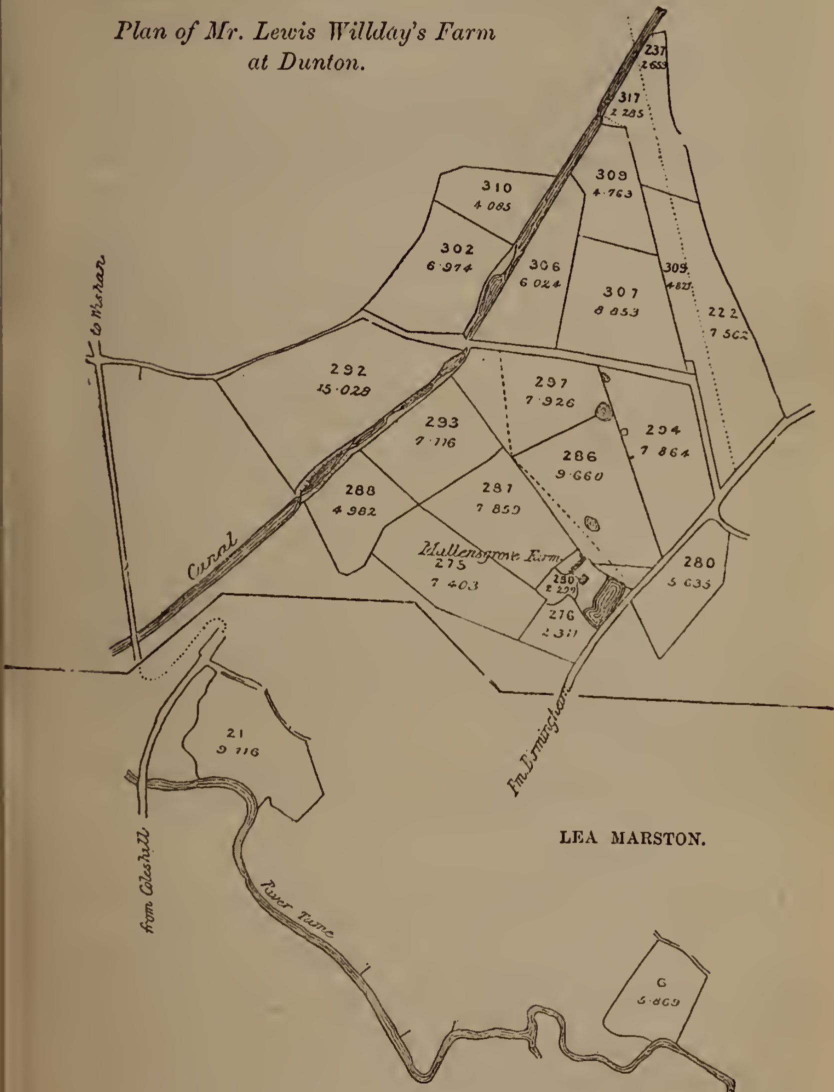
No *Pigs* are bred, but several are bought and fed out as porkers.

A stack or two of wheat straw is generally sold off this farm, and makes from 2*l.* to 3*l.* per ton, costing 2*s.* per ton binding, and 12*s.* for carriage. The straw is not wanted for manurial purposes, on account of the large quantity of Birmingham refuse that is available.

The *Wheat*, like most of that seen in other occupations, was a little thin in places. It has been top dressed with some 5

to 6 cwt. of soot per acre; it is of a very strong and healthy appearance, with every prospect of a good yield.

Plan of Mr. Lewis Willday's Farm at Dunton.



One field of *Barley* is grown on land from which turnips and swedes had been fed off by sheep with cake, and was an

extraordinary crop, the only fear being that, in the event of heavy rains, it might get lodged before fully in ear. Another field of Webb's Kinver Chevalier had been a little cut up with wireworm. It was laid down with seeds, and was rather full of annual weeds.

Rather more *Oats* than barley are grown on this farm, and one field, being sown on a wheat stubble, and top dressed with 5 cwt. of soot per acre, looked like being a very grand crop. In fact, the whole of the oats looked remarkably well and very free from weeds, though the drought had affected them in some places.

Seeds were a very stout crop. Part of the field had a dressing of Birmingham refuse, and the other one of farmyard manure, both being applied in the autumn; and we were of opinion that the side on which the former had been used was rather the heavier crop.

Mangel was one of the best crops that we had seen on our rounds. All had been singled, and left a very level plant, with scarcely a weed to be found. *Swedes* are sown on the ridge about 20 inches apart, and with a dressing of about 60 tons per acre of Birmingham refuse. They were being horse-hoed, and were a very even plant. The white turnips had not been sown.

The *Grass lands* had suffered more from the drought than the arable. This is to be accounted for by the fact that there is nowhere more than six inches of soil above the gravel. The fields that were shut up for hay, what with the drought, and having been fed late into the spring, looked like producing a very small haystack.

Mr. Willday tells us he takes the work with the men, and we consider him a hard-working, industrious young farmer.

Class III.—Second Prize Farm.

Occupied by Mrs. A. B. and Mr. S. K. Spencer, The Mount, Blackhill, Snitterfield, near Stratford-on-Avon.

This farm comprises 126 acres, 78 arable and 48 grass, and has been held from Lady Trevelyan on a yearly tenancy since 1879.

A pretty drive of four miles from Stratford-on-Avon brought us to this farm. The house is situated on a hill overlooking the valley of the Avon, and commands very fine and extensive views, the Malvern Hills, forty miles distant, being visible on a clear day.

The farm buildings are roomy and convenient, and well

adapted for the tenants, who are largely occupied in fattening cattle for the Stratford market.

To show the peculiarity of the rainfall in this district, we may mention that a farm we visited in the immediate neighbourhood of this holding had had a bountiful supply of rain during the season, while Mr. Spencer had suffered so much from drought that he had been obliged to turn stock into a field of seeds that he had already shut up for hay, because there would not have been anything worth mowing, although there was a good plant of clover all over the field. Another field, that had been left for hay, had been dressed with 12 tons of lime compost per acre in the autumn, but was so cut up by drought that our advice was to mow it at once and trust to a second crop.

The working *Horses* were three in number, and one horse was kept for general purposes. They were a very good lot, far beyond an ordinary small farmer's team. At our first visit, one mare was in foal to Hitchin Conqueror, and at our second visit the foal had been sold to Mr. Freeman-Mitford, who is keeping the mare till harvest, for 32*l.* 10*s.*

The *Cattle* numbered twenty-four—one dairy-cow, seven fattening cows and heifers, eleven two-year-old stirks, one heifer, one calf, and three weanlings. They are of no particular breed. Most of these had been sold on our second visit with the exception of the eleven stirks. These were being fed on the grass, and were having an allowance of 3 lb. of linseed cake a day each. They were a nice lot, and getting very forward in condition.

The number of *Sheep* fed and sold off this farm fat, last year, was 278. At the time of our first visit there were eighty-three sheep on the farm (fifteen ewes in-lamb, and sixty-eight tegs). These latter were sold to a butcher, to take away as he wanted them, at $8\frac{1}{2}$*d.* per pound, making an average of 46*s.* 6*d.* each. 128 had since been bought, costing 40*s.* each in the wool, and had been fed with mangel and about $\frac{3}{4}$ lb. of cake each, and on our June visit were ready to be sent to market at once. The fifteen ewes had lambed down twenty-one lambs, but the latter did not seem to have done very well.

Three *Sows* were kept, and their produce are fatted and sold as baconers at Stratford-on-Avon.

The *Corn crops*, both wheat, barley, and oats, were generally looking exceedingly well. A small field of wheat had lost plant a little, and a field of early barley was beginning to feel the effects of the drought.

The winter *Beans*, though a nice plant when we were here

on our first visit, had been ploughed up, and *Peas* sown in their place. These were now looking remarkably well, and, like all the other crops, were very clean. The spring beans had every appearance of being an average crop.

The *Mangel* were a nice plant, and were being cut out, a woman following each man to single as they went along. The crop was very clean. The *Swedes* were being sown on the day we went over the farm.

The *Grass land* near the house is of poor quality, but that at a distance, about 26 acres, lying in the valley, is of very good quality; 16 acres of this was shut up for mowing, and looked like cutting an average crop.

Class III.—Reserved Farm.

Occupied by Mr. Charles Thornton, Curdworth, near Birmingham.

The farm consists of 131 acres, 80 arable and 51 grass, and is held on a yearly tenancy from Lord Norton and other owners. The soil is sandy, with gravel and marl.

The Birmingham and Fazeley Canal passes through the centre of the farm, and affords the same facilities for obtaining manure as was noted in the case of Mr. Willday.

The *Horses* on this farm were young and useful; the *Cattle* few in number, but a very fair sort.

As regards the *Sheep*, the in-lamb ewes were of the Shropshire breed, well bred, and big. The tegs were a useful lot, but rather rough in the coat. No pigs were kept. The farm was most of it clean, and the fences were well kept. The farm buildings were not so good as they might have been.

Mr. Thornton makes a great feature of growing potatoes, for which he finds a ready market.

The Judges feel that they cannot conclude their report without expressing their deep sense of the courtesy they experienced at the hands of each and every one of the competitors. This was not only evidenced in the great readiness with which all necessary information was afforded, but also in the unbounded hospitality which was everywhere offered to them. Their visit to Warwickshire will always be looked back upon by the Judges as a very pleasant episode.

J. B. Ellis.

Official Report.

QUARTERLY REPORT OF THE CHEMICAL COMMITTEE,

July, 1892.

1. Mr. D. Craig, of Graveleys, Great Waltham, Chelmsford, brought for analysis on May 7 a sample of what he said had been purchased as Bone Superphosphate at 6*l.* per ton, and which was guaranteed (though not in writing) to contain 35 per cent. of phosphates.

Upon analysis the following results were shown :—

	May 17, 1892.	
Moisture	18·88	
[1] Organic matter and water of combination	4·35	
Monobasic phosphate of lime	12·79	
equal to tribasic phosphate of lime (bone phosphate) rendered soluble by acid	(20·04)	100·00
Insoluble phosphates	4·34	
Sulphate of lime, alkaline salts, &c.	55·35	
Insoluble siliceous matter	4·29	

This is not bone superphosphate at all, but is an ordinary mineral superphosphate of lower quality than usual, and such as would be dear at 3*l.* per ton at the present time.

In answer to inquiries Mr. Craig wrote :—

J. A. Voelcker, Esq. July 4, 1892.

Dear Sir,—In reply to your letter, I have settled the affair with . . . I had the manure of, by paying him superphosphate price, as he said he made a mistake, and sent the mineral super instead of bone super.

Yours faithfully,

Donald Craig.

P.S.—I paid 3*l.* 5*s.* per ton for the manure.

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2. Mr. J. Hepple, of Capheaton Hall, Newcastle-upon-Tyne, sent on May 19, on behalf of Sir John Swinburne, Bart., a sample of 4 tons of Bone Meal which had been purchased at 6*l.* per ton carriage paid.

The order given on April 15, 1892, was for 4 tons of Best English Bone-Meal, 4½ per cent. ammonia, 45 per cent. phosphates.

The report given on the sample was as follows :—

	May 27, 1892.	
Moisture	10·87	100·00
[1] Organic matter	35·33	
Phosphate of lime	41·58	
[2] Carbonate of lime, common salt, &c.	10·32	
Sand	1·90	
[1] containing nitrogen	3·63	
equal to ammonia	4·41	
[2] including common salt	2·99	

This is low in quality, and contains some admixture of salt.

The vendors offered 10*s*. per ton allowance, but Mr. Hepple did not consider this sufficient, and ultimately 1*l*. per ton was deducted.

The following case is interesting, inasmuch as it shows the care which must be taken so as not to be misled by a form of guarantee.

3. Mr. J. F. Honeyball, of Teynham, Sittingbourne, sent on June 2 a sample of "Queenborough Special Hop Manure." This had been supplied to him by the manufacturers, The Sheppy Glue and Chemical Works, Limited ; London Offices, 34 Mark Lane, E.C., Works, Queenborough, near Sheerness.

The price was 6*l*. 17*s*. 6*d*. per ton, and the guarantee was in the following terms :—"Guaranteed analysis : 23 to 26 per cent. of Phosphates, 5½ to 6 per cent. of Ammonia and 10 per cent. of Potash Salts."

Dr. Voelcker's analysis showed the following results :—

	June 14, 1892.	
Moisture	16·35	100·00
[1] Organic matter and water of combination	17·48	
Monobasic phosphate of lime	12·75	
equal to tribasic phosphate of lime (bone phosphate) rendered soluble by acid	(19·97)	
Insoluble phosphates	11·98	
Sulphate of lime, alkaline salts, &c.	34·10	
Insoluble siliceous matter	7·34	
[1] containing nitrogen	·87	
equal to ammonia	1·05	

Mr. Honeyball complained to the vendors as to the deficiency in ammonia, and they in reply said that there was a printer's error in the circular ; in consequence they had since withdrawn the circular. The guarantee, they stated, should have read "and 1½ per cent. of ammonia, equal to 5½ to 6 per cent. sulphate of ammonia." After some further correspondence the vendors agreed to an allowance of 2*l*. per ton on the two tons purchased.

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4. Mr. H. F. Frampton, of Moreton, Dorchester, sent for analysis on May 4 a sample of Linseed-cake, which, it appeared subsequently, had been purchased by one of his tenants.

The following report was returned :—

May 14, 1892.

Moisture	9·27	100·00
Oil	11·16	
[1] Albuminous compounds (flesh-forming matters)	24·81	
Mucilage, sugar, and digestible fibre	33·03	
Woody fibre (cellulose)	8·87	
[2] Mineral matter (ash)	12·86	
[1] containing nitrogen	3·81	
[2] including sand	7·57	

A grossly impure cake with numerous kinds and large quantities of foreign and weed seeds, and over 7½ per cent. of sand.

A cake that is not fit to be used for stock.

Among the foreign seeds referred to were the following: spurrey, *Camelina sativa*, rape, cockle-seed, and polygonum.

Mr. Frampton stated that the cake had been purchased as pure.

The farmer was unwilling to give any further particulars of the transaction.

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5. Mr. D. Eardley, of Westbrook, Burton-on-Trent, forwarded on May 11 a sample of cake, 2 tons 5 cwt. of which had been bought as Linseed-cake from . . . the price being 9*l.* per ton.

The following report was returned :—

May 23, 1892.

Moisture	11·35	100·00
Oil	10·85	
[1] Albuminous compounds (flesh-forming matters)	21·75	
Mucilage, sugar, and digestible fibre	39·10	
Woody fibre (cellulose)	8·66	
[2] Mineral matter (ash)	8·29	
[1] containing nitrogen	3·48	
[2] including sand	3·83	

An impure and inferior cake that ought not to be called "linseed-cake" at all. It contains in large amount, cockle-seed, rape, spurrey, and other weed-seeds, besides nearly 4 per cent. of sand.

Upon Mr. Eardley sending the invoices of transactions extending over the past year, it was found that in every case the cake was described either as "oil-cake" or simply as "cake."

Mr. Eardley added that he fetched the cake in odd lots when he happened to run short, and that he always sent for Linseed-cake.

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6. Mr. G. Greenfield, of North Saiths, Eakring, Newark, sent on May 28 a sample of Linseed-cake, which he stated was guaranteed to him to be "95 per cent. pure."

The following report was given :—

	June 9, 1892.	
Moisture	12·39	100·00
Oil	14·55	
[1] Albuminous compounds (flesh-forming matters)	25·69	
Mucilage, sugar, and digestible fibre	31·51	
Woody fibre (cellulose)	7·92	
[2] Mineral matter (ash)	7·94	
[1] containing nitrogen	4·11	
[2] including sand	3·19	

An impure cake, containing considerable starchy impurity, weed-seeds, and over 3 per cent. of sand.

On making close inquiries, Dr. Voelcker ascertained from Mr. Greenfield that he only had the dealer's word that the cake was "95 per cent. pure"; it was not branded, nor was there any *written* guarantee. Moreover, the vendor was a friend.

The vendor, in his turn, stated that he had no doubt about the cake, as he gave the top market price for it from the manufacturer.

Neither the name of vendor nor of manufacturer was forthcoming, but 5*s*. a ton was allowed.

July 26, 1892. EMLYN, *Chairman.*

Notes, Communications, and Reviews.

NEW MODES OF DISPOSING OF FRUIT AND VEGETABLES.

In the height of the cherry season this year I had the pleasure of showing Mr. Emory E. Smith, an eminent fruit-grower and horticulturist from California, the Kentish methods of cultivating, picking, and packing cherries. He was much impressed with the size and vigorous growth of the trees, the mode of treating them, and the quantity and quality of the fruit; but he shuddered as he saw the ripe, juicy cherries poured into the half sieves, or half bushels, from the baskets of the pickers without any selection or assortment. "Such fruit as this," Mr. Emory Smith said, "we should pick just before it was quite ripe, handle it most tenderly, and classify it carefully, and put the best into shallow wooden boxes, arranged in tiers, and send it to New York and other large cities and towns. Although it would be perhaps sometimes three days or more on its journey, it would arrive as fresh as when packed, and command high prices." It might not be possible to treat the whole of a large crop of cherries in England in this way, but the best might at least be packed in small quantities after the American fashion, and would, it is believed, be readily saleable in all large towns in Great Britain, and even in Paris and other Continental cities, whose inhabitants would soon appreciate the incomparable lusciousness and flavour of fine English cherries.

We may learn many other lessons as to the distribution and disposal of our fruit from the Americans. Our own systems are imperfect. The same remark applies equally to vegetables. We can grow fruits and vegetables to perfection. In many cases, it may be said in most cases, the producer gets only the lowest wholesale price for these, and this frequently is an unremunerative price, not because the whole of the fruit-loving and vegetable-eating portion of the population are surfeited with these luxuries, but that there is a glut in a few centres to which the growers crowd in their produce.

Mr. Dan. Pidgeon's interesting paper entitled *Fruit Evaporation*

in America, which appeared in this Journal in 1888,[1] explained the details of a mode of treating fruit in the United States, and showed the great extent of the industry and its enormous increase in recent years. As the term implies, the evaporation of fruit is simply driving out the watery parts by heat, thus reducing the bulk and weight, making it portable and easy to preserve on account of its dryness. This process is mainly applied to apples, pears, and peaches, as well as to vegetables of many kinds.

Attempts have been made to introduce "evaporation" into this country as a means of disposing of surplus fruits and vegetables in seasons of abundance, but at present there has been no action on the part of producers and preservers in this direction. Evaporating machines, as used in America, have been exhibited at the Royal Agricultural Society's Meetings[2] and at several local shows, suitable either for large or small producers and preservers. Trials have shown that their work is satisfactory, and, as further proof of this, one has only to notice the apple and peach "rings" and "chips" on sale in all the grocers' shops in Great Britain, imported from the United States and Canada, and dried by these machines. As giving some idea of the importance of this industry it may be stated that, in 1890, 4,436,671 lb. of fruit, preserved without sugar, of the value of 70,972*l*., was imported into this country from the United States, and in all probability a large part of this consisted of fruit preserved by evaporation. Holland, Belgium, Germany, and France also import large quantities of fruit prepared in this way. Australia and South Africa receive considerable imports of it "for making jam, compotes, marmalades, etc." A particular sort of apple is imported into France in this evaporated state for making cider. In the season 1889–90 over 90,000 cwt. were received in France for this purpose.

All kinds of vegetables are evaporated. Potatoes, pumpkins, vegetable and custard marrows, carrots, parsnips, French beans and tomatoes, are cut into slices and subjected to heat in the evaporating machines to drive off their watery parts. Peas and broad beans are also treated by this process. In this way, vegetables of all descriptions are available at all seasons of the year, and merely require boiling for a short time to make them fit for consumption. In the same manner, evaporated fruit may be stewed, or baked in pies, or boiled, sugar being added according to taste, and cannot be distinguished from fruit that has been bottled, or preserved with sugar.

There is another method of treating fruit and vegetables adopted in the United States and Canada, even more important than evaporation, known as "canning," or preserving in tin cans and glass jars. Fruit and vegetables preserved in this way will keep for very

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[1] Journal R.A.S.E., Vol. XXIV. (2nd Series), p. 487.

[2] One of these took a silver medal at the Nottingham Meeting in 1888, and a prize of 30*l*. was awarded at Windsor in 1889 to a machine of the same kind.

long periods, as the air is exhausted, and the germs of fermentation are excluded. As regards fruit, much or little sugar may be used, or none at all. It is thought by jam-makers that the use of sugar tends to retard fermentation, and the precautions that are taken to drive out the germs of fermentation and to exclude them are most inadequate, so that jam made in the ordinary manner will not keep good beyond a year, or two years at most. If an American is asked to define fruit-preserving, he will say that it is treating fruit in such a way that it will keep good for an indefinite period ; while an English person would make reply, that it means boiling, stewing, or baking fruit and sugar together. The old-fashioned receipt of one pound of sugar to one pound of fruit is still religiously adhered to by domestic fruit preservers. In jam factories this hard and fast rule is not observed, but excessive quantities of sugar are added, which makes the jam sweet and mawkish, depriving it of all real fruit flavour.

Canning might be adopted in Great Britain with much advantage, as well as evaporation, both for fruit and vegetables, by producers themselves, and by the establishment of factories to which this produce could be consigned. By these means surplus fruit could be utilised, and the panic prices that are occasionally caused by temporary gluts in the markets would be avoided.

Twenty-five years ago canning had hardly been instituted in the United States : now it is general in fruit and vegetable growing centres. In California especially there has been a vast development of it, and in other fruit-producing States it is making rapid progress. There are many factories in the States of Maine and New Jersey solely for canning tomatoes and green maize. It is said that when one of these factories is established in districts suitable for the production of fruit and vegetables, the value of the land in the neighbourhood is quickly increased, and the demand for labour and its wages are greatly augumented.

A canning factory is provided with apparatus and machinery necessary for paring, coring, and stoning fruit. It is furnished with large tanks heated by steam for boiling the fruit and vegetables. The process is as follows :—The fruit, in the case of apples, peaches, and pears, is pared, cored, and washed in troughs in which there is clean water. It is then crammed as tightly as possible into the cans. Plums are rapidly stoned by machinery and put closely into the cans. Then the cans are marked with the class of fruit in them, and are arranged in racks holding many dozens, and placed upon trucks and carried to a tank of syrup from which each can is filled up. At this juncture caps, or metal coverings, are soldered on by means of a clever machine which works most rapidly. A tiny hole is left in the centre of each cap. The truck with the cans is moved forward to a tank, containing boiling water, in which the racks of cans lifted from the trucks are placed and kept for spaces of time varying with the kind of fruit. It should be mentioned here that the hole left in the cap is so small that no water gets in and no syrup comes out. After this boiling, the racks of cans are replaced on the truck and passed

on to a station where the holes in the caps are stopped with solder. Again the cans are put into boiling water for a few minutes to destroy any germs within them that might cause fermentation. They are then labelled and packed for delivery. In some of the larger factories the cans are made by machinery in the upper part of the building, and are rolled down a track in a continuous stream to the stage where the fruits and vegetables are prepared.

Syrup is added just in sufficient proportion to make the fruit pleasant to the taste, and not with any idea of preserving it. To pears and apples from five to six ounces are given per quart can ; to peaches and apricots from three to four ounces per quart can ; gooseberries, blackberries, currants, cherries, and plums take from six to seven ounces per quart can.

With regard to vegetables, the same process is adopted, but, of course, no sugar is added, and the cans are filled two-thirds full of water. The vegetables are prepared as for cooking, and they must be boiled much longer than fruits. Tomatoes are canned most extensively, and retain their fine flavour and agreeable qualities for long periods. Green peas, French beans, asparagus, and young carrots are peculiarly suited for this process.

Glass jars are being used for preserving fruit and vegetables in the United States to a considerable extent, as they have many advantages over tin cans, which are supposed in some slight degree to communicate unpleasant flavour and unwholesome quality by the acids of the fruit and vegetables acting upon the metal. Besides, cans are not so economical, as they only serve one turn. Glass jars do not communicate any flavour or taint to their contents if well washed, and are useable again and again. The glass jars that are used in the United States are shown by the figures A and B, given on p. 593, and have metal lids which are screwed on. These are termed "Lightning" and "Mason's" respectively, and vary in capacity from one pint to two quarts.

The Queensland Department of Agriculture is advocating the adoption of canning and preserving fruit by these American modes. In a pamphlet written by Mr. Shelton, Instructor in Agriculture, issued by the Queensland Agricultural Department, it is pointed out that fruit and vegetables in their natural state will not keep for any length of time ; also that Queensland, with its suitable soil and climate, produces fruits and vegetables in great quantity and of fine quality. Mr. Shelton says : "Fruit properly canned will keep for an indefinite period in any climate, and canned fruit, more nearly than that preserved by any other method, resembles in flavour and texture the natural article. These *à priori* reasons why canned fruit should be popularly sought after in Queensland are amply reinforced by facts, showing that it is consumed in large quantities. There are no figures showing how much of home-made preserves, canned fruits, &c., are used in Queensland, but in 1890 we imported from all the ends of the world 37,793 quarts of canned fruit, worth 16,000*l*., and of dried fruit, not including currants and raisins, 497,127lb., of a value of 8,126*l*. The total, 24,127*l*., paid in one year

for imported bottled and dried fruits alone, on which a duty of 3*s.* per dozen of canned fruit, and 2*d.* per lb. of the dried was paid, sufficiently attests the thoroughness of the colonial appetite for preserved fruits. Nothing is truer than this, however, that the demand for fruits—preserved and green—can be almost indefinitely increased. The appetite grows on what it feeds on. Make fruits cheap as they can be made in Queensland, and the present extraordinary consumption in the colony of meat, cheese, and tea, to say nothing of alcoholic beverages, will give place in great degree to the much more healthful and palatable products of orchard and garden." This has been remarkably exemplified in Great Britain. With the extension of fruit cultivation in the country, there has been an astonishing

A B

increase in the appreciation of it and in the demand for it, particularly in the form of jam, which has now become a feature of the "breakfast-table," and is rapidly becoming an indispensable adjunct to the homely fare of the working classes, who cannot afford good butter, and object, not unnaturally, to margarine.

Mr. Shelton advises Queensland farmers to plant fruit trees and to grow vegetables. He remarks that the truth is, that an orchard, not necessarily set out on a commercial scale, is always profitable, and usually the most profitable part of the farm. "The orchard adds to the value of every acre of the farm on which it is located. Let every colonial farmer plant fruit trees without delay to produce

fruit for his own use, for the market, and for posterity, for fruit-growing involves the element of time as does no other crop. When the market for green fruit fails, there are yet opportunities for the profitable disposition of it."

These are, canning, evaporating, and drying by sun, which, of course, can only be adopted in certain climates, besides the ordinary jam making, which, as has been shown above, is almost the sole means of absorbing the surplus fruit not required for eating in a fresh condition in Great Britain. Large producers of fruit and vegetables in the United States and Canada have found it imperative to establish factories for canning and evaporating, just as British growers have recently discovered the necessity of jam factories to utilise the fruit they cannot sell satisfactorily in a natural state. Jam factories are being erected in all districts devoted to fruit culture in this country, and it is believed, when the advantages of canning and evaporating fruits and vegetables are fully realised, factories for these operations will be erected, or machinery for these processes added to existing jam factories. We should be able to make at home the evaporated fruit and vegetables which are now imported from the United States in such large quantities, as well as those canned. With respect to canned fruit, we ought to be able to undersell the American manufacturer, as sugar is more than 100 per cent. cheaper in this country.

Mr. Shelton points out to the Queenslanders that "the canning of fruit and vegetables is not work for the factory and capitalist alone. Large as the factory interest is in the States, it seems to me clear that the canned fruit and vegetables made in American homes largely exceed in amount and value the product of the factories of the country. The annual canning there for use in the family recurs with the fruit season in well nigh every household. The cheapness of the purchasable article of canned goods has doubtless greatly stimulated domestic consumption, but this home canning goes on as before. It should be remembered that fruit and vegetable canning is one of the home industries that is within easy reach of every adult person of ordinary intelligence."

Mr. Shelton gives in his useful pamphlet receipts for canning and evaporating fruit, both upon a large and small scale, for factory as well as for domestic use. These receipts are mainly extracted from a lecture upon "Canning Fruit," delivered before an Agricultural Conference held by the Agricultural and Pastoral Society of Southern Queensland at Beenleigh, by Mrs. Shelton, who is evidently an expert in all kinds of fruit preserving. Mrs. Shelton not only formulated receipts, but demonstrated them by canning fruit and vegetables before an interested assembly. Mrs. Shelton remarked first that now "the fruit-grower is sure of a market. The introduction of fruit canning into California has revolutionized the fruit-growing industry of that State. In former times the markets of that State were in much the same position as ours are in to-day in Australia—frequently a feast and frequently a famine. The condition of the market was spasmodic, and prices fluctuated. In good

seasons there was abundance of fruit and low prices ; in poor seasons the fruits were poor and prices high. As a consequence, men were loth to invest their money in the business. The art of fruit preserving and drying has changed all this. The fruit-grower no longer depends upon a local market ; his markets are in London, Asia, and Australia. Fruit-canning has steadied the local market, because the fruit-grower depends upon local demand for green fruit only as an auxiliary to his business, which he will supply if he gets his price. If not, he will send his fruit to the cannery, where there is ever a demand for it, or dry it and ship it himself."

After pointing out the dietetic value of fruit, Mrs. Shelton hoped to convince the ladies present of the desirability of having on hand a good supply of canned fruit for family use, and to show them how they might can fruit for themselves. "There are women in America," Mrs. Shelton added, "who do a large business in putting up home-canned fruits, jellies, pickles, &c.—for these are superior to factory goods. These ladies began in a very small way, trying to make their fruit as perfect as possible, and increased their business as the demand for their superior goods increased ; now there is one lady who sends her goods all over the United States.

"The process of canning is a simple one, being merely to drive out the germs of fermentation by heating the fruit and excluding the air. Success in canning depends not on the amount of sugar used, but on the entire exclusion of air. To accomplish this there are two methods in use. The first and most perfect method, and that employed by the canning factories, is to pack the fruit, neatly prepared, as closely as possible into the glass jars. Fill the jars with a syrup made by boiling water and sugar together, in the proportion of about one cup of sugar to one quart of water. This will make syrup enough for two quart jars. Place the jar in a tank or boiler of tepid water on a rack, so as to allow the water to come within an inch of the top of the jar ; screw on the cover loosely without the rubber, cover the tank or boiler, and boil till the fruit is done. Ten, or at most twelve, minutes are enough for berries, currants, or other small fruits ; from twenty minutes to three hours for peaches, pears, and apples. Have some syrup ready for filling up the jars. When done, remove the jar from the water, fill to the top with hot syrup, wipe off the neck, put on the rubber, and screw down the cover tightly.

"The second method is the one most used by the housewife in America. It is simply to boil the fruit in sugared water in a porcelain lined stewpan, or kettle, until it is sufficiently cooked, and pour it boiling hot into the jars, stirring it about with a spoon to let the air bubbles escape ; fill up with hot juice or syrup, wipe the neck with a moist towel, put on the rubber, and screw down the cover tightly, and tighten again when cold. A tin funnel to put in the mouth of the jar, made for the purpose, facilitates the filling of the jar. If the fruit is in pieces like apples, peaches, and pears, it should be placed in the jars carefully with a fork or spoon, a little sugared water being first put in to temper the jars. If there is fruit remaining in the

kettle, it should be drawn to one side of the stove, and not allowed to overcook while the filling process is going on; frequently fruit is spoiled in this way. In an accident or oversight of this kind it is better to use the fruit right up on the table, and prepare fresh fruit for the jars. The advantages of this method are that much more fruit can be put into each jar after shrinking by cooking than in the fresh state. A bushel of cherries, berries, currants, or peaches can then be disposed of in a half day by a woman accustomed to canning. To achieve the best results in this work it is necessary that the fruit be fresh, of best quality, and not over-ripe. Soft fruit, like strawberries, should be canned the day they are picked. It is better not to can any fruit picked overnight, and care should be used in handling all fruits for canning purposes. All jars must be in perfect condition. After having been once used, they should be thoroughly scalded and put away. The rubber should be put inside the can and the top screwed on loosely. This is a better plan than screwing the top tightly on to the rubber. Fruit in glass jars must be kept in a cool, dry place, away from the light, preferably in a cool, dark cellar. Thick brown paper should be wrapped round jars where there is light." Mrs. Shelton stated that she preferred the Mason patent jar (Fig. B, p. 593). The "Lightning" patent, however, with adjustable wire fastening, saves time, labour, and breakage.

After Mrs. Shelton had read her paper she proceeded to give practical effect to the same. A small table was arranged upon which were jars, fruit, syrup, and a small kerosene stove. The fruit was put into the jars, which were filled with syrup, and the process described above was minutely carried out. The whole operation lasted a few minutes, and was eagerly witnessed by the ladies present, who paid the most careful attention to the whole process.

In answer to questions, Mrs. Shelton said that the "quantity of sugar used ranged from four to eight ounces per quart, but it really was a matter of taste, the object being not so much to have the fruit sweetened, but rather that it should be stewed so as to retain its flavour; for the matter of that, it could be put up without any sugar at all. Vegetables were canned without any sugar.

"To can tomatoes successfully, they must be kept away from the light. No sugar is used at all. The tomatoes are put into the kettle or boiler, and boiled for about twenty minutes to cook them thoroughly, and the jar filled quickly and put away from the light; or the tomatoes may be cooked in the jars."

The Under-Secretary for Agriculture for Queensland, Mr. McClean, was present at this lecture, and the proceedings showed that the question of fruit-growing, and the disposition of fruit by canning, evaporating, and drying, is receiving serious attention in this Colony. The question is a very important one, not only for young colonies, but also for old countries like Great Britain, whose long-accustomed staple crop has ceased to be remunerative. Fruit and vegetable growing cannot, of course, be expected to take the place of wheat production, but it may be considerably extended if energy and judgment are exercised in carrying out the details of selecting,

planting, and cultivating, and in taking advantage of every mode of disposing of the produce.

The Queenslanders have been quick to see the advantages of the various systems of dealing with fruit and vegetables that have been described, which are so profitably practised by the Americans, and there is no reason why they may not be successfully adopted in this country, both upon a large scale in factories and buildings for the purpose, as well as upon a small scale in the homes of the people.

It would be useful if Technical Education Committees of County Councils were to send capable teachers of the fruit, preserving industry into country districts to give lectures, like Mrs. Shelton in Queensland. These would be difficult to obtain at first, but in time capable persons would arise. I was asked lately to name someone able to give lectures on fruit and vegetable preserving, and after many inquiries I was obliged to confess that I had failed to discover anyone possessing the necessary acquirements.

CHARLES WHITEHEAD.

CASTOR-OIL SEED IN CATTLE FOODS.

THE very poisonous effects of the seed of the castor-oil plant (*Ricinus communis*), when eaten by human beings, have been known for a long time. Dr. Taylor, in his text-book on *Medical Jurisprudence*, mentions several cases in which severe illness and even death have resulted from eating these seeds; and, although in one of the cases cited, an adult ate seventeen seeds and, nevertheless, recovered from the effects, in another case a man died in forty-six hours after eating three seeds only. Two friends of the writer, moreover, were made seriously ill after eating three or four castor seeds.

Of the oil, which is obtained from them by pressure, nothing need be said here, but it is not generally known that this is not the only physiologically active ingredient which the seed contains. In the embryo is found another active principle, and it is to this that must be attributed the severe effects which are experienced from the internal administration of the seed.

The action on the human system Dr. Taylor describes in these words: "Soon after the pulp has been swallowed, there is severe pain in the abdomen, copious and painful vomiting with bloody purging, thirst and convulsions, terminated by death." It is, however, more particularly the corresponding effect of the castor-seed on farm stock which will be found of interest to agriculturists.

Individual cases under this head are not so numerously reported as in the case of human beings; for, the seeds not being used in farm practice in the same way as linseed, cotton, rape, and other oil-seeds, they do not find a place in the granary, and there is probably

no case on record of the seeds having been intentionally given to stock.

From time to time, however, cases of severe purging among stock, followed occasionally by death, have been brought under notice, and the mischief has been traced, in some of the cases at least, to the presence of castor-seed in one or other of the feeding stuffs given to the animals.

From what has been said as to the quantity of these seeds which is required to cause illness or death to human beings, it will be readily understood that not many seeds need be administered to sheep or cattle in order to produce like effects, and should the seed exist in a cattle food, several pounds of which constitute a daily ration, it will be likewise clear that one or two seeds per pound are all that are necessary in order to produce harmful results, if not death.

Such small quantities of any seed when present in a cattle food may, admittedly, be easily overlooked during even a careful microscopical search. In such examinations, as anyone who is accustomed to use the microscope will appreciate, no very large portion of a food can be examined at one time, and it may consequently happen that, if a number of samples of a food containing, say, only half a dozen seeds of any kind per pound, be examined, in none of these may the particular seed be present. In the case of castor-oil seed the difficulties are considerably increased, owing to the opacity of the seed-case and the consequent non-revelation of the structure.

It has been mentioned above, that cases of severe purging and death of stock have been from time to time reported. It was during a search made for the purpose of ascertaining the cause of the death of some stock that the writer, when working in the laboratory of the Royal Agricultural Society, under Dr. Voelcker, succeeded in discovering a method by which even very small quantities of castor-seed in a cattle food could be separated, and not merely be recognised but also weighed.

It would be out of place to trouble the readers of this Journal with any full description of the technical details of the process employed. These are given in a paper which was laid before the Society of Public Analysts in June last.[1] It will suffice to say that a quantity of the suspected food is digested, first with dilute hydrochloric or sulphuric acid (1 to 2 per cent.), and then with dilute potash or soda. By this means the husk or fibre is separated from the other constituents. If, then, the husk, after being washed clean, is subjected to the action of either sodium hypochlorite or of ordinary bleaching powder, it will be found that the husk of castor-oil seed remains perfectly unbleached, even after several days, whereas the husk of linseed, cotton-seed, rape, buckwheat, locust-bean, and other seeds which occur in feeding-cakes, will bleach entirely in three or four hours. The unbleached husks may be then picked out from the rest of the material, and can be readily recognised under the microscope, its structure being then clearly visible. It will perhaps be

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[1] The *Analyst*, vol. xvii. No. 195, July 1892, p. 121, *et seq.*

of interest to know the results of some investigations made by this process.

The experiments were made with some good undecorticated cotton-cake, which had been proved to be quite free from any admixture of castor-seed.

To each of three separate pounds of this cake, crushed finely, one castor-seed was added, also in a broken condition. Since it is the testa (or outer coat) of the seed, and not the whole seed, which is separated by the process, the testa of each of the three seeds was weighed and then intimately mixed with the pound of cotton-seed cake.

In experiment I. the seed-testa weighed 3·45 grains, and of this 3·10 grains were recovered.

In experiment II. the seed-testa weighed 1·89 grains, and of this 1·35 grains were recovered.

In experiment III. the seed-testa weighed 1·00 grain, and of this 0·65 grain was recovered.

From these experiments it will be seen that not only can this poisonous seed be *detected* when present in a cattle food to the extent of only one seed per pound, but that a very fair idea of the actual *quantity* may be obtained also.

The question naturally arises : How comes it that small quantities of castor-seed are present in cattle foods at all ? As cases of damage to stock have been "brought home" to the presence of this seed in the foods, inquiry on this point has naturally been made. Both Dr. Bernard Dyer and Mr. Smetham have pointed out[1] that the castor-oil plant grows as a *weed* amongst the cotton crop. This readily accounts for its presence in small amount amongst the cotton-seed on the arrival of the latter in England. Unfortunately, too, the seed is about the same size as the cotton-seed, so that a process of sieving would not readily remove it. Were it the case that castor-seed is exclusively found in cotton-cakes, and never in linseed-cakes or in other foods, one might conclude that this was the only reason for its occurrence. Unhappily this is not so. The late Dr. Voelcker, in his paper on "Linseed-cakes" (Journal, R.A.S.E., Second Series, ix. 27) says that he has repeatedly found it in *linseed-cake*. Again, in the Journal R.A.S.E., Third Series, Vol. iii., Part II., p. 347, Dr. J. A. Voelcker mentions the case of a linseed-cake which contained castor-seed. In another place, Dr. Dyer states that he has found castor-seed in niger seed-cake and in linseed-cake, and Mr. Smetham refers to two cargoes of decorticated cotton-seed meal which he had to condemn, because they contained castor-seed. Lastly, the writer has found this same seed in maize meal.

Where the castor-oil plant is cultivated for the sake of the oil which the seed contains, the latter is crushed and pressed, and there remains a "cake," known by the name "castor poonac." This ought only to be used as a manure, but it is to be feared that, either through carelessness or else by deliberate admixture, it some-

[1] The *Analyst*, vol. xvii. No. 195, p. 125.

times finds its way among the materials used for cakes or for manufactured cattle foods.

The greatest care should therefore be taken, wherever *castor poonac* is made or stored, that no portion of it, or sweepings of the floors where it has been kept, should by any chance find their way into materials used as cattle food. It is also well to point out the risks that are run in the purchase of so-called "oil-cakes," which are not made of pure linseed, but contain screenings of linseed, sweepings of floors, and other impurities, among which castor-oil seed may from time to time not improbably occur.

J. W. LEATHER.

CULTIVATED PLANTS OF THE FUTURE.[1]

IN asking what are the possibilities that other plants than those we now employ may be utilised we enter upon a many-sided inquiry. Speculation is rife as to the coming man. May we not ask what plants the coming man will use?

There is an enormous disproportion between the total number of species of plants known to botanical science and the number of those which are employed by man.

The species of flowering plants already described and named are about one hundred and seven thousand. Acquisitions from unexplored or imperfectly explored regions may increase the aggregate perhaps one-tenth, so that we are within very safe limits in taking the number of existing species to be somewhat above one hundred and ten thousand.

Now if we were to make a comprehensive list of all the flowering plants which are cultivated on what we may call a fairly large scale at the present day, placing therein all food and forage plants, all those which are grown for timber and cabinet woods, for fibres and cordage, for tanning materials, dyes, resins, rubber, gums, oils, perfumes, and medicines, we could bring together barely three hundred species. If we were to add to this short catalogue all the species, which, without cultivation, can be used by man, we should find it considerably lengthened. A great many products of the classes just referred to are derived in commerce from wild plants, but exactly how much their addition would extend the list, it is impossible in the present state of knowledge to determine. Every enumeration of this character is likely to contain errors from two sources: first, it would be sure to contain some species which have outlived their real usefulness; and, secondly, owing to the chaotic condition of the literature of the subject, omissions would occur.

[1] Abstract of the Presidential Address on "Some of the Possibilities of Economic Botany," delivered before the American Association for the Advancement of Science, at Washington, 1891, by George Lincoln Goodale, M.D., LL.D., Fisher Professor of Natural History, Harvard University, Cambridge, Mass., U.S.A. With additions by the Author.

But after all proper exclusions and additions have been made, the total number of species of flowering plants utilised to any considerable extent by man in his civilised state does not exceed, in fact it does not quite reach, one per cent.

The disproportion between the plants which are known and those which are used becomes much greater when we take into account the species of flowerless plants also. Of the five hundred ferns and their allies we employ for other than decorative purposes only five; the mosses and liverworts, roughly estimated at five hundred species, have only four which are directly used by man. There are comparatively few algæ, fungi, or lichens which have extended use.

Therefore, when we take the flowering and flowerless together, the percentage of utilised plants falls far below the estimate made for the flowering plants alone.

Such a ratio between the number of species known and the number used justifies the inquiry, Can the short list of useful plants be increased to advantage? If so, how?

This is a practical question; it is likewise a very old one. In one form or another, by one people or another, it has been asked from early times. In the dawn of civilisation, mankind inherited from savage ancestors certain plants which had been found amenable to simple cultivation, and the products of these plants supplemented the spoils of the chase and of the sea. The question which we ask now was asked then. Wild plants were examined for new uses; primitive agriculture and horticulture extended their bounds in answer to this inquiry. Age after age has added slowly and cautiously to the list of cultivable and utilisable plants, but the aggregate additions have been, as we have seen, comparatively slight.

The question has thus no charm of novelty, but it is as practical to-day as in early ages. In fact, at the present time, in view of all the appliances at the command of modern science and under the strong light cast by recent biological and technological research, the inquiry assumes great importance. One phase of it is being attentively and systematically regarded in the great experiment stations, another phase is being studied in the laboratories of chemistry and pharmacy, while still another presents itself in the museums of economic botany.

The question may be put in other words, which are even more practical. What present likelihood is there that our tables may, one of these days, have other vegetables, fruits, and cereals, than those which we use now? What chance is there that new fibres may supplement or even replace those which we spin and weave, that woven fabrics may take on new vegetable colours, that flowers and leaves may yield new perfumes and flavours? What probability is there that new remedial agents may be found among plants now neglected or wholly unknown? The answer which will be attempted is not in the nature of a prophecy; it can claim no rank higher than that of a reasonable conjecture.

At the outset it must be said that synthetic chemistry has made

and is making some exceedingly short cuts across this field of research, giving us artificial dyes, odours, flavours, and medicinal substances, of such excellence that it sometimes seems as if before long the old-fashioned chemical processes in the plant itself would play only a subordinate part. But although there is no telling where the triumphs of chemical synthesis will end, it is not probable that it will ever interfere essentially with certain classes of economic plants. It is impossible to conceive of a synthetic fibre or a synthetic fruit. Chemistry gives us fruit-ethers and fruit-acids, and after a while may provide us with a true artificial sugar and amorphous starch; but artificial fruits worth the eating or artificial fibres worth the spinning are not coming in our day.

Despite the extraordinary achievements of synthetic chemistry, the world must be content to accept, for a long time to come, the results of the intelligent labour of the cultivator of the soil and the explorer of the forest. Improvement of the good plants we now utilise, and the discovery of new ones, must remain the care of large numbers of diligent students and assiduous workmen. So that, in fact, our question resolves itself into this: Can these practical investigators hope to make any substantial advance?

It seems clear that, except in modern times, useful plants have been selected almost wholly by chance, and it may well be said that a selection by accident is no selection at all. Nowadays, the new selections are based on analogy. One of the most striking illustrations of the modern method is afforded by the utilisation of bamboo fibre for electric lamps.

Some of the classes of useful plants must be passed by without present discussion; others alluded to slightly, while still other groups fairly representative of selection and improvement will be more fully described. In this latter class would naturally come, of course, the food plants known as

I. The Cereals.

The species of grasses which yield these seed-like fruits, or as we might call them for our purpose seeds, are numerous; twenty of them are cultivated largely in the Old World, but only six of them are likely to be very familiarly known—namely, wheat, rice, barley, oats, rye, and maize. The last of these is of American origin, despite doubts which have been cast upon it. It was not known in the Old World until after the discovery of the New. It has probably been very long in cultivation. The others all belong to the Old World. Wheat and barley have been cultivated from the earliest times; according to De Candolle, the chief authority in these matters, about four thousand years. Later came rye and oats, both of which have been known in cultivation for at least two thousand years. Even the shorter of these periods gives time enough for wide variation, and as is to be expected there are numerous varieties of them all.

If the Chinese records are to be trusted, rice has been cultivated for a period much longer than that assigned by our history and

traditions to the other cereals, and the varieties are correspondingly numerous. It is said that in Japan above three hundred varieties are grown on irrigated lands, and more than one hundred on uplands.

With the possible exception of rice, not one of the species of cereals is certainly known in the wild state.

It is out of our power to predict how much time would elapse before satisfactory substitutes for our cereals could be found. In the improvement of the grains of grasses, other than those which have been very long under cultivation, experiments have been few, scattered, and indecisive. Therefore, we are as badly off for time-ratios as are the geologists and archæologists in their statements of elapsed periods. It is impossible for us to ignore the fact that there appear to be occasions in the life of a species when it seems to be peculiarly susceptible to the influences of surroundings. A species, like a carefully laden ship, represents a balancing of forces within and without. Disturbance may come through variation from within, as from a shifting of the cargo, or in some cases from without. We may suppose both forces to be active in producing variation, a change in the internal condition rendering the plant more susceptible to any change in its surroundings. Under the influence of any marked disturbance, a state of unstable equilibrium may be brought about, at which times the species as such is easily acted upon by very slight agencies.

One of the most marked of these derangements is a consequent of cross-breeding within the extreme limits of varieties. The resultant forms in such cases can persist only by close breeding, or by propagation from buds, or the equivalents of buds. Disturbances like these arise unexpectedly in the ordinary course of nature, giving us sports of various kinds. These critical periods, however, are not unwelcome, since skilful cultivators can take advantage of them. In this very field much has been accomplished. An attentive study of the sagacious work done by Thomas Andrew Knight shows to what extent this can be done.[1] But we must confess that it would be absolutely impossible to predict with certainty how long or how short would be the time before new cereals, or acceptable equivalents for them, would be provided. Upheld by the confidence which I have in the intelligence, ingenuity, and energy of our experiment stations, I may say that the time would not probably exceed that of two generations of our race, or half a century.

In now laying aside our hypothetical illustration, I venture to ask why it is that our experiment stations, and other institutions dealing with plants and their improvement, do not undertake investigations like those which I have sketched? Why are not some of the grasses other than our present cereals studied with reference to their adoption as food grains? One of these species will naturally

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[1] *A Selection from the Physiological and Horticultural Papers*, published in the Transactions of the Royal and Horticultural Societies, by the late Thomas Andrew Knight, Esq. London, 1841.

suggest itself—namely, the wild rice of the lakes. Observations have shown that, were it not for the difficulty of harvesting these grains, which fall too easily when they are ripe, they might be utilised. But attentive search might find or educe some variety of *Zizania*, with a more persistent grain and a better yield. There are two of our seashore grasses which have excellent grains, but are of small yield. Why are not these, or better ones which might be suggested by observation, taken in hand?

The reason is plain. We are all content to move along in lines of least resistance, and are disinclined to make a fresh start. It is merely leaving well enough alone, and so far as the cereals are concerned it is indeed well enough. The generous grains of modern varieties of wheat and barley compared with the well-preserved charred vestiges found in Greece by Schliemann, and in the lake-dwellings, are satisfactory in every respect. Improvements, however, are being made in many directions; and in the cereals we now have, we possess far better and more satisfactory material for further improvement, both in quality and as regards range of distribution, than we could reasonably hope to have from other grasses.

From the cereals we may turn to the interesting groups of plants comprised under the general term

II. Vegetables.

Under this term it will be convenient for us to include all plants which are employed for culinary purposes, or for table use, such as salads and relishes.

The potato and sweet potato, the pumpkin and squash, the red or capsicum peppers, and the tomato, are of American origin.

All the others are, most probably, natives of the Old World. Only one plant coming in this class has been derived from Southern Australasia—namely, New Zealand spinach (*Tetragonia*).

Among the vegetables and salad-plants longest in cultivation we may enumerate the turnip, onion, cabbage, purslane, the large bean (Faba), chick-pea, lentil, and one species of pea (garden-pea). To these an antiquity of at least 4,000 years is ascribed.

Next to these, in point of age, come the radish, carrot, beet, garlic, garden-cress, and celery, lettuce, asparagus, and the leek. Three or four leguminous seeds are to be placed in the same category, as are also the black peppers.

Of more recent introduction the most prominent are the parsnip, oyster-plant, parsley, artichoke, endive, and spinach.

From these lists there are purposely omitted a few which belong exclusively to the tropics, such as certain yams.

The number of varieties of these vegetables is astounding. It is, of course, impossible to discriminate between closely allied varieties which have been introduced by gardeners and seedsmen under different names, but which are essentially identical. Nevertheless, the potato has innumerable varieties, of which at least forty are easily distinguishable. Celery has more than twenty varieties;

carrot more than thirty; beet and radish more than forty; lettuce and onion more than fifty; turnip more than seventy; cabbage, kidney-bean, and garden-pea more than one hundred.

The amount of horticultural work which these numbers represent is enormous. Each variety established as a race (that is, *a variety which comes true to seed*) has been evolved by the same sort of patient care and waiting which we have seen is necessary in the case of cereals, but the time of waiting has not been as a general thing so long.

In the case of the cabbage there are important morphological changes like those to which Professor Bailey has called attention in the case of the tomato. Suppose we are strolling along the beach at some of the seaside resorts of France, and should fall in with this coarse cruciferous plant, with its sprawling leaves and strong odour. Would there be anything in its appearance to lead us to search for its hidden merit as a food-plant? What could we see in this wild cabbage which would give it a preference over a score of other plants at our feet?

Again, suppose we are journeying in the high lands of Peru, and should meet with a strong-smelling plant of the nightshade family (*Solanaceæ*), bearing a small irregular fruit, of sub-acid taste and of peculiar flavour. We will further imagine that the peculiar taste strikes our fancy, and we conceive that the plant has possibilities as a source of food. We should be led by our knowledge of the potato, probably a native of the same region, to think that this allied plant might be safely transferred to a northern climate, but would there be promise of enough future usefulness, in such a case as this, to warrant our carrying the plant north as an article of food? Suppose, further, we should ascertain that the fruit in question was relished not only by the natives of its home, but that it had found favour among the tribes of South Mexico and Central America, and had been cultivated by them until it had attained a large size; should we be strengthened in our venture? Let us go one step further still. Suppose that, having decided upon the introduction of the plant, and having urged everybody to try it, we should find it discarded as a fruit, but taking a place in gardens as a curiosity under an absurd name, or as a basis for preserves and pickles; should we not look upon our experiment in the introduction of this new plant as a failure? This is not a hypothetical case.

The tomato, the plant in question, was cultivated in Europe as long ago as 1554; it was known in Virginia in 1781 and in the Northern States in 1785; but it found its way into favour slowly, even in this land of its origin. A credible witness states that in Salem it was almost impossible to induce people to eat or even taste of the fruit. And yet, as is well known, its present cultivation on an enormous scale in Europe and the United States is scarcely sufficient to meet the increasing demand.

Before asking specifically in what direction we shall look for new vegetables, it may be useful to call attention, in passing, to a

very few of the many which are already in limited use in Europe and North America, but which merit a wider employment. Cardon, or cardoon; celeriac, or turnip-rooted celery; fetticus, or corn-salad; martynia; salsify; sea-kale; and numerous small salads, are examples of neglected treasures of the vegetable garden.

The following, which are even less known, may be mentioned as fairly promising:—

(1) *Arracacia esculenta*, called Arracacha, belonging to the parsley family (*Umbelliferæ*). It is extensively cultivated in some of the northern States of South America. The stems are swollen near the base, and produce tuberous enlargements filled with an excellent starch. Although the plant is of comparatively easy cultivation, efforts to introduce it into Europe have not been successful, but it is said to have found favour in both the Indies, and may prove useful in our Southern States.

(2) *Ullucus* or Ollucus, another tuberous-rooted plant from nearly the same region, but belonging to the spinach, beet, and mangel family (*Chenopodiaceæ*). It has produced tubers of good size in England, but they are too waxy in consistence to dispute the place of the better tubers of the potato. The plant is worth investigating for our hot dry lands.

(3) A tuber-bearing relative of the common white dead-nettle, or *Stachys*, is now cultivated on a large scale at Crosnes, in France, for the Paris market. Its name in Paris is taken from the locality where it is now grown for use. Although its native country is Japan, it is called by some seedsmen Chinese artichoke. At the present stage of cultivation, the tubers are small and are rather hard to keep, but it is thought "that both of these defects can be overcome or evaded." Experiments indicate that we may have in this species a valuable addition to our vegetables.

We must next look at certain other neglected possibilities.

Dr. Edward Palmer has brought together very interesting facts relative to the food-plants of the North American aborigines. Among the plants described by him there are a few which merit careful investigation. Against all of them, however, there lie the objections mentioned before, namely:—

(1) The long time required for their improvement, and

(2) The difficulty of making them acceptable to the community, involving

(3) The risk of total and mortifying failure.

In 1854 the late Professor Asa Gray called attention to the remarkable relations which exist between the plants of Japan and those of the eastern coast of North America. He not only proved that the plants of the two regions had a common origin, but also emphasised the fact that many species of the two countries are almost identical. It is to that country which has yielded us so many useful and beautiful plants that we turn for new vegetables to supplement our present food resources.

One of the most convenient places for a preliminary examination of the vegetables of Japan is at the railroad stations on the longer

lines—for instance, that running from Tokio to Kobe. For native consumption there are prepared luncheon boxes of two or three stories, provided with the simple and yet embarrassing chopsticks. It is worth the shock it causes one's nerves to invest in these boxes and try the vegetable contents. The bits of fish, flesh, and fowl which one finds therein can be easily separated and discarded, upon which there will remain a few delicacies. The pervading odour of the box is that of aromatic vinegar. The generous portion of boiled rice is of excellent quality, with every grain well softened and distinct, and this without anything else would suffice for a tolerable meal. In the boxes which have fallen under my observation there were sundry boiled roots, shoots, and seeds which were not recognisable by me in their cooked form. Professor Georgeson, formerly of Japan, has identified some of these,[1] but he says, "There are doubtless many others used occasionally."

One may find sliced lotus roots, roots of large burdock, lily bulbs, shoots of ginger, pickled green plums, beans of many sorts, boiled chestnuts, nuts of the gingko tree, pickled greens of various kinds, dried cucumbers, and several kinds of seaweeds. Some of the leaves and roots are cooked in much the same manner as beet-roots and beet-leaves are by us, and the general effect is not unappetising. The boiled shoots are suggestive of only the tougher ends of asparagus. On the whole, I do not look back on Japanese railway luncheons with any longing which would compel me to advocate the indiscriminate introduction of the constituent vegetables here.

But when the same vegetables are served in native inns, under more favourable culinary conditions, without the flavour of vinegar and of the pine-wood of the luncheon boxes, they appear to be worthy of a trial in our horticulture, and I therefore deal with one or two in greater detail.

Professor Georgeson, whose advantages for acquiring a knowledge of the useful plants of Japan have been unusually good, has placed me under great obligations by communicating certain facts regarding some of the more promising plants of Japan which are not now used here. It should be said that several of these plants have already attracted the notice of the Agricultural Department of the United States.

The soy bean (*Glycine hispida*). This species is known in the United States to some extent, but we do not have the early and best

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[1] Pickled daikon, the large radish, often grated; ginger roots; shoga; beans (*Glycine hispida*), many kinds, and prepared in many ways; beans (*Dolichos cultratus*), cooked in rice and mixed with it; sliced hasu, lotus roots; lily bulbs, boiled whole and the scales torn off as they are eaten; pickled green plums (ume-boshi), coloured red in the pickle by the leaves of *Perilla arguta* (shiso); sliced and dried cucumbers, kiuri; pieces of gobo—roots of *Lappa major*; rakkio, bulbs of *Allium Bakeri*, boiled in shogu; grated wasabi, stem of *Eutrema Wasabi*; water-cress, midzu-tagarashi (not often). Also sometimes pickled greens of various kinds, and occasionally chestnut kernels boiled and mixed with a kind of sweet sauce; nut of the Ginkgo tree, *Salisburia adiantifolia*. Several kinds of seaweeds are also very commonly served with the rice.—*Professor Georgeson in letter.*

varieties. These beans replace meat in the diet of the common people.

Mucuna (*Mucuna capitata*) and dolichos (*Dolichos cultratus*) are pole beans possessing merit.

Dioscorea. There are several varieties with palatable roots. Years ago one of these was spoken of by the late Dr. Gray as possessing "excellent results, if one could only dig them."

Colocasia antiquorum has tuberous roots, which are nutritious.

Conophallus Konjak has a large bulbous root which is sliced, dried, and beaten to a powder. It is an ingredient in cakes.

Aralia cordata is cultivated for the shoots, and used as we use asparagus.

Œnanthe stolonifera and *Cryptotænia canadensis* are palatable salad plants, the former being used also as greens.

Before passing on to the next class, an improvable group of plants —the beverage plants—may here be noticed.

The principal beverage plants, tea, coffee, and cocoa, are all attracting the assiduous attention of cultivators. The first of these plants is extending its range at a marvellous rate of rapidity through India and Ceylon; the second is threatened by the pests which have almost exterminated it in Ceylon, but a new species, with crosses therefrom, is promising to resist them successfully; the third, chocolate, is every year passing into lands farther from its original home. To these has been added the Kola, of a value as yet not wholly determined.

III. Fruits.

Botanically speaking, the cereal grains of which we have spoken are true fruits—that is to say, are ripened ovaries, but for all practical purposes they may be regarded as seeds. The fruits of which mention is now to be made are those commonly spoken of in our markets as fruits.

First of all, attention must be called to the extraordinary changes in the commercial relations of fruits by two direct causes—

(1) The canning industry, and

(2) Swift transportation by steamers and railroads.

The effects of these two agencies are too well known to require more than this passing mention. By them the fruits of the best fruit-growing countries are carried to distant lands in quantities which surprise all who see the statistics for the first time, for the ratio of increase is very startling.

In the Colonial Exhibition at London, in 1886, fruits from the remote colonies were exhibited under conditions which proved that, before long, it may be possible to place such delicacies as the cherimoyer, the sweet-cup, sweet-sop, rambutan, mango, and mangosteen, at even our most northern seaports. Furthermore, it seems to me likely that, with an increase in our knowledge with regard to

the microbes which produce decay, we may be able to protect the delicate fruits from injury for any reasonable period. Methods which will supplement refrigeration are sure to come in the very near future, so that even in a country so vast as our own, the most perishable fruits will be transported through its length and breadth without harm.

The canning industry and swift transportation are likely to diminish zeal in searching for new fruits, since, as we have seen in the case of the cereals, we are prone to move along lines of least resistance, and to leave well enough alone.

To what extent are our present fruits likely to be improved? Even those who have watched the improvement in the quality of some of our fruits, like oranges, can hardly realise how great has been the improvement within historic times in the character of certain pears, apples, and so on.

The term historic is used advisedly, for there are pre-historic fruits which might serve as a point of departure in the consideration of the question. In the ruins of the lake-dwellings in Switzerland, charred apples have been found, which are in some cases plainly of small size, hardly equalling ordinary crab apples. But in certain directions there has been no marked change of type—the change is in quality.

In comparing the earlier descriptions of fruits with modern accounts, it is well to remember that the high standards by which fruits are now judged are of recent establishment. Fruits which would once have been esteemed excellent would to-day be passed by as unworthy of regard.

It seems probable that the list of seedless fruits will be materially lengthened, provided our experimental horticulturists make use of the material at their command. The common fruits which have very few or no seeds are the banana, pine-apple, and certain oranges. Others mentioned by Darwin as well known are the bread-fruit, pomegranate, arazole or Neapolitan medlar, and date-palms. In commenting upon these fruits, Darwin says that most horticulturists "look at the great size and anomalous development of the fruit as the cause, and sterility as the result," but he holds the opposite view as more probable—that is, that the sterility, coming about gradually, leaves free for other growth the abundant supply of building material which the forming seed would otherwise have. He admits, however, that "there is an antagonism between the two forms of reproduction, by seeds and by buds, when either is carried to an extreme degree, which is independent of any incipient sterility."

Most plant-hybrids are relatively infertile, but by no means wholly sterile. With this sterility there is generally augmented vegetative vigour, as shown by Nägeli. Partial or complete sterility, and corresponding luxuriance of root, stem, leaves, and flower, may come about in other obscure ways, and such cases are familiar to botanists. Now, it seems highly probable that, either by hybridising directed to this special end, or by careful selection of forms indicating this tendency to the correlated changes, we may succeed

in obtaining important additions to our seedless or nearly seedless plants. Whether the ultimate profit would be large enough to pay for the time and labour involved is a question which we need not enter into; there appears no reasonable doubt that such efforts would be successful. There is no reason in the nature of things why we should not have strawberries without the so-called seeds; blackberries and raspberries with only delicious pulp; and large grapes as free from seeds as the small ones which we call "currants," but which are really grapes from Corinth.

These, and the coreless apples and pears of the future, the stoneless cherries and plums, like the common fruits before mentioned, must be propagated by bud-division, and be open to the tendency to diminished strength said to be the consequence of continued bud-propagation. But this bridge need not be crossed until we come to it. Bananas have been perpetuated in this way for many centuries, and pineapples since the discovery of America, so that the borrowed trouble alluded to is not threatening.

It is absolutely necessary to recollect that, in most cases, variations are slight. Of this, many illustrations have been adduced, all of which show the necessity of extreme patience and caution. The student curious in such matters can have hardly any task more instructive than the detection of the variations in such common plants as the blueberry, the wild cherry, or the like. It is an excellent preparation for a practical study of the variations in our wild fruits suitable for selection.

It was held by the late Dr. Gray that the variations in nature by which species have been evolved were led along useful lines—a view which Darwin regretted he could not entertain. However this may be, all acknowledge that, by the hand of the cultivator, variations can be led along useful lines; and, furthermore, the hand which selects must uphold them in their unequal strife. In other words, it is one thing to select a variety, and another to assist it in maintaining its hold upon existence. Without the constant help of the cultivator who selects the usual variety, there comes a reversion to the ordinary specific type which is fitted to cope with its surroundings.

IV. Vegetable Fibres.

The vegetable fibres known to commerce are either plant hairs, of which we may take cotton as the type, or filaments of bast-tissue, represented by flax. No new plant hairs have been suggested which can compete in any way for spinning with those yielded by the species of Gossypium, or cotton, but experiments more or less systematic and thorough are being carried on with regard to the improvement of the varieties of the species. Plant hairs for the stuffing of cushions and pillows need not be referred to in connection with this subject.

Countless sorts of plants have been suggested as sources of good bast-fibres for spinning and for cordage, and many of these make capital substitutes for those already in the factories. But the

questions of cheapness of production, and of subsequent preparation for use, have thus far militated against success. There may be much difference between the profits promised by a laboratory experiment and those resulting from the same process conducted on a commercial scale. The existence of such differences has been the rock on which many enterprises seeking to introduce new fibres have been wrecked.

In dismissing this portion of our subject it may be said that a process for separating fine fibres from undesirable structural elements and from resin-like substances which accompany them is a great desideratum. If this were supplied, many new species would assume great prominence at once.

V. Fragrant Plants.

Another illustration of our subject might be drawn from a class of plants which repays close study from a biological point of view—namely, those which yield perfumes.

In speaking of the future of our fragrant plants we must distinguish between those of commercial value and those of purely horticultural interest. The former will be less and less cultivated in proportion as synthetic chemistry by its manufacture of perfumes replaces the natural by the artificial products ; for example, coumarin, vanillin, nerolin, heliotropin, and even oil of wintergreen.

When, however, one has seen that the aromatic plants of Australia are almost free from attacks of insects and fungi, and has learned to look on the impregnating substances in some cases as protective against predatory insects and small foes of all kinds, and in others as fungicidal, he is tempted to ask whether all the substances of marked odour which we find in certain groups of plants may not play a similar *rôle*.

It is a fact of great interest to the surgeon that in many plants there is associated with the fragrant principle a marked antiseptic or fungicidal quality ; conspicuous examples of this are afforded by species of *Eucalyptus*, yielding eucalyptol, *Styrax*, yielding styrone, *Thymus*, yielding thymol. It is interesting to note, too, that some of these most modern antiseptics were important constituents in the balsamic vulneraries of the earliest surgery.

Florists' plants and the floral fashions of the future constitute an engaging subject, which we can touch only lightly. It is reasonably clear that while the old favourite species will hold their ground in the guise of improved varieties, the new introductions will come in the shape of plants with flowering branches which retain their blossoms for a somewhat long period, and especially those in which the flowers precede the leaves. In short, the next real fashion in our gardens is probably to be the flowering shrub and flowering tree, like those which are such favourites in the country from which the Western world has gladly taken the gift of the chrysanthemum.

Twice each year, of late, a reception has been held by the Emperor

and Empress of Japan. The receptions are in autumn and in the spring. That in the autumn, popularly known as the Emperor's reception, has for its floral decorations the myriad forms of the national flower, the chrysanthemum; that which is given in spring, the Empress's reception, comes when the cherry blossoms are at their best. One has little idea of the wealth of beauty, in masses of flowering shrubs and trees, until he has seen the floral displays in the Imperial Gardens and the Temple grounds in Tokio.

Conclusion.

It is hardly possible to deal with the questions which attach themselves to our main question, especially as to the limits of effect which cultivation may produce. We cannot touch the problem of inheritance of acquired peculiarities, or the manner in which cultivation predisposes the plant to innumerable modifications. Two of these modifications may be mentioned in passing, because they serve to exemplify the practical character of our subject.

Cultivation brings about in plants very curious morphological changes. For example, in the case of a well-known vegetable the number of metamorphosed type-leaves forming the ovary is two, and yet under cultivation the number increases irregularly until the full number of units in the type of the flower is reached. Professor Bailey has called attention to some further interesting changes in the tomato, but the one mentioned suffices to illustrate the direction or variation which plants under cultivation are apt to take. Monstrosities are very apt to occur in cultivated plants, and under certain conditions may be perpetuated in succeeding generations, thus widening the field from which utilisable plants may be taken.

Another case of change produced by cultivation is likewise as yet wholly unexplained, although much studied—namely, the mutual interaction of scion and stock in grafting, budding, and the like. It is probable that a further investigation of this subject may yet throw light on new possibilities in plants.

It may be premature to allude to the possibilities which have been opened up of late years in agriculture and horticulture through studies of bacteriology, and the relation of microbes to plant nutrition. The vexed problem of the indirect appropriation by plants of atmospheric nitrogen has assumed a new phase, and is now being solved in what would have been regarded a few years ago as an impossible manner.

Experiments in so-called "water-culture" and in the large field-laboratories give promise of extending the sphere of economic botany. This means, of course, a vast increase of possibilities in both horticulture and agriculture.

We have now arrived at the most practical question of all, namely:—

In what way can the range of commercial botany be extended?

In what manner, or by what means, can the introduction of new species be hastened?

The great amount of un-coordinated work which has been done and is now in hand in the direction of bringing in new plants has hardly yet been appreciated.

The competition between the importers of new plants is so great both in the Old World and the New that a very large proportion of the species which would naturally commend themselves for the use of florists, for the adornment of greenhouses, or for commercial ends, have been at one time or another brought before the public or are being accumulated in stock. The same is true, although to a less extent, with regard to useful vegetables and fruit. Hardly one of those which we can suggest as desirable for trial has not already been investigated in Europe or in the United States, and reported on. The pages of our chemical, pharmaceutical, medical, horticultural, agricultural and trade journals, especially those of high grade, contain a wealth of material of this character.

But what is needed is this: that the promising plants should be systematically investigated under exhaustive conditions. It is not enough that an enthusiast here, or an amateur there, should give a plant a trial under imperfectly understood conditions, and then report success or failure. The work should be thorough, and every question answered categorically, so that we might be placed in possession of all the facts relative to the object experimented upon. But such an undertaking requires the co-operation of many different agencies, such as botanic gardens, museums and laboratories, and experiment stations.

By these agencies, wisely directed and energetically employed, the domains of commercial and industrial botany will be enlarged. It is to some of the possible results in these domains that attention has been directed.

G. L. Goodale.

SMALL HOLDINGS IN FRANCE.

At the present time, when the question of Small Holdings has been brought prominently before the country, it must be desirable to borrow all the light we can get thrown on the subject from the experience of other countries, which have continually retained a system which is now the subject of an experimental revival in Great Britain. If any useful deductions are to be drawn from the working of Small Holdings abroad, it is obvious that the region selected must not differ widely in point of climate from the country bounding the English side of the Channel.

For the above reason mainly I determined to concentrate an investigation which I recently made on a limited area of Picardy, having Amiens for its centre—a district of all others the most accessible to Englishmen, but nevertheless economically little known to our countrymen, who annually rush through it by thousands.

Having been thrown into intimate relations with the peasantry of North-Eastern France, for the whole duration of the Franco-German war, while engaged in administering the *Daily News* Relief Fund, I enjoyed exceptional opportunities of becoming acquainted with their economic and social position. Having revisited North-Eastern France almost annually ever since, I have constantly endeavoured to improve on those opportunities by correcting first impressions and gaining fresh information.

Being an extensive landowner myself, and farming very largely in Cambridgeshire, I approach my subject with a very varied experience of dealing with land. I am certainly in the position, not enjoyed by all writers on the question, of being brought into close contact, at different times of each year, both with English labourers and with French peasants. It is this vantage ground which emboldens me to dispute the assertions of writers in *The Times* and British Consular Reports, that the lot of the French peasant is the harder of the two.

When the late Lady Verney published her work on the French Peasantry, I ventured to draw attention, in a letter published in *The Times*, to the fact that there is another and a more favourable side of the question than that taken by her. In the present paper I hope to produce some evidence that, if the social and economic position of the French peasant is really so deplorable, he is extraordinarily clever in concealing it from the impartial observer. It may be true that his surroundings do not always justify his gaiety, but it is contrary to my experience that he can be truly described as worse off than a British labourer. Just before leaving London I armed myself with the latest report of a British Consul, that of Mr. B. Pauncefote, dated Nantes, February 25, 1892. On page 12, Consul Pauncefote remarks: "The position of peasant proprietors in this district is a miserable one, and I do not see how it can be improved." And a writer in the *Daily Graphic* of April 8, 1892, goes a great deal further: "As to the proprietors, by far the largest number lead lives, which, for privations of all kinds, may be considered as miserable as any that the world knows of. I have seen peasant proprietors in various parts of France, and frankly, in comparison with their existence, that of the agricultural labourer in England is a desirable one. If the latter only gets twelve shillings a week, provisions are so cheap in England that he is able at any rate to nourish himself with wholesome, and even comfortable food. He has his tea, his bacon, and his white bread. The French peasant considers white bread so much a luxury, that in many villages it is only to be seen on his table on Sundays, in some places only on fête days. . . . Coffee is rarely, if ever, drunk."

Such reports as these, though doubtless containing much that is true with reference to the regions reported on, are, I maintain, highly misleading if taken, as they are too apt to be, to apply to French peasants generally. In the above quotation, for instance, not a word is said about milk, which in North-Eastern France constantly enters into the dietary of the French peasant, as does also white bread. Coffee is taken regularly twice a day—in the morning and at 4

p.m., with abundance of milk and white bread, in the villages about Sedan. Nor can I doubt that the milk supply in Western France is at least as abundant as in the North-East, where the rainfall is less.

With the view of making fresh inquiries in the locality now in question, and of acquiring fresh data there for a comparison between French peasants and British labourers, I left England for Amiens in the early part of May, 1892. The contrast between the English and French scenery, as viewed from the railway, was certainly very pronounced. Kent was looking veritably the "garden of England," in its May freshness and habitual neatness. The regular lines of fruit plantations and endless intersecting vistas of hop-poles, with their network of brown gossamer-like threads, all spoke of orderly husbandry and large outlay of capital. As you approach nearer the coast you cannot fail to be struck with the smoothness of the pastures, the whiteness of the sheep, each with a lamb by its side, and the trimness of the fences. Residences of the landed gentry are frequent, cottages are neat and substantial, and farm buildings are in good repair.

On the French side of the Channel almost everything in the way of buildings that you see from the railway is in bad repair and untidy. The fences are untrimmed and display frequent gaps, and the outlook is generally dreary. Long rows of flimsy cottages, with no upstair bedrooms, and neglected waste ground, instead of flower gardens, about them, tell of the unloveliness of the lives of the inmates. Sandy tracts, flat low-lying pastures intersected by straight-cut ditches, and long-drawn-out swamps, fringed with poplars, make up the main features of the landscape between Boulogne and Amiens. We are certainly not in the garden of France here. One would be quite inclined to accept as literally true the reports referred to above, if one went no farther than this.

But you have only to ascend, on either side, out of the low-lying ground—it hardly deserves the name of valley—followed by the railway, when you find the scene suddenly changed. Once at the top of the ascent, you see stretched out before you a vast undulating plateau, cut up into endless narrow strips of many colours, bright green predominating at the spring season. No kind of fence, hedge, or single trees are anywhere to be descried amongst the cultivated patches, and not even grass "balks" divide the strips where the ground is flat. There is nothing, in square miles of plain, behind which man or beast could hide or on which bird could alight. Where the ground is hilly it is cut into successions of terraces, connected by low grass banks (called *rideaux* in Picardy), and proclaiming the wide diffusion hereabouts of the common field system of agriculture, so admirably treated of by Mr. F. Seebohm in his *English Village Community*. Absolutely unbroken by any outstanding object as are the wide expanses of patchwork cultivation, most of the summits of the rolling ground are crowned with woods, now in their freshest green, and all the villages are embowered in plantations and orchards. The general effect of the concentration of the trees into

masses and the absence of hedges and hedgerow timber, cutting the lines of the landscape into squares as with us, make up a highly effective picture. To the agricultural eye, it suggests obvious difficulty in turning out stock to graze, except sheep within hurdles.

Just as the trees are all massed into woods, so are all the farm-houses and cottages congregated into villages, to the serious detriment of the more distant portions of the territory of each, which get little or no manure.

Unfortunately beet-root culture is rapidly diminishing in this district—the western division of the department of La Somme, of which Amiens is the chief town. As no turnips are grown, the soil, which is light (the sub-soil being chalk), is becoming rapidly exhausted, from the habit of taking two straw crops in succession. Clovers, tares, and occasional fallows, preparing for mangel, alternate with the strips of wheat, rye and spring corn. But the clovers are seldom fed off on the land, which only gets an occasional night-folding by sheep, which have picked up a precarious living off the grass slopes of the terraces, or any other bit of waste ground, in the day time. Such more remunerative crops as flax, hemp, colza, &c., are now rarely grown.

In the course of a three-hours' drive westwards from Amiens to Molliens-Vidame over the district described above, I am confident that I did not see a dozen peasants at any kind of work in the fields, and those few were mostly women. The absence of root cultivation would largely account for this, but there should have been a good deal of hoeing going on in the corn.

On the chalk range between Hitchin and Newmarket uninclosed parishes presenting precisely similar features, *i.e.* countless narrow strips, varying from half an acre to an acre or two, divided by grass balks, are still to be seen. But in England these features are survivals of what was, according to Mr. Seebohm, two hundred years ago almost universal over a great part of this country. In France, as every tourist can see at a glance, the narrow strips are still well-nigh universal, but it was reserved to Mr. Seebohm to draw attention to their remote antiquity.

The legislation on the subject of land-tenure has been diametrically opposite in the two countries. In England the Enclosure Acts have left few specimens of the primitive common field patch-work agriculture. In France, the influence of the Code Napoléon has still further subdivided the strips it found in existence.

Having given a general description of the aspect of the country for many miles around Amiens (the description would apply almost equally to the region extending to Rheims, a hundred miles to the eastward), I will proceed to give a somewhat detailed description of the commune of Vraignes, lying a few miles westward of Molliens-Vidame, and adjacent to the town of Hornoy, *chef-lieu du canton.*

It may be convenient that I should state here the administrative divisions of France, viz.: the Commune, Canton, Arrondissement, Department. Each commune, arrondissement, and department has its separate council, called respectively: Conseil Municipal, Conseil

d'Arrondissement, Conseil Général. Of these the first and the last have important functions, but the Conseil d'Arrondissement is admittedly almost superfluous. The Conseil Municipal is the Parish Council, and the Conseil Général answers to our County Council.

Every commune, however small, has its 'Conseil Municipal,' never consisting of less than ten members, and not exceeding ten if the population is under 500. For populations between 500 and 1,500 the number of municipal councillors is fixed at twelve. The commune of Vraignes, the population of which is under 200, has ten councillors; and the adjoining commune, Thieulloy l'Abbaye, with a population now just under 500, has likewise only ten. The Conseil Municipal is elected every four years, and the elections took place all over France on May 1 last. At the preceding election Thieulloy l'Abbaye was entitled to twelve councillors, which number had to be reduced by two on May 1, owing to the population having fallen below 500. As the position of municipal councillor is much coveted, unusual excitement is said to have prevailed at the recent election. A fortnight later, on Sunday, May 15, it became the duty of the newly elected councillors all over France to elect their mayor. Being on a visit to Monsieur Abdias de Vismes, a municipal councillor at Vraignes, I was permitted to attend the election, which took place at the Mairie in the afternoon. All ten councillors were present, with the schoolmaster, who is also secretary of the Mairie. Of the councillors, the outgoing mayor—Monsieur Cocu—M. de Vismes, M. Lesot, M. Bethambeau, and M. Hiesse are *cultivateurs*, or farmers of land, partly their own, partly hired. M. Abdias de Vismes, who is of noble descent, is the only farmer in the village holding over 100 acres. He has lately hired 50 in addition to the 99 belonging to himself or members of his own family. M. Henri is a wheelwright, M. Barron a carpenter, M. Petit a *ménager* (a class intermediate between the farmer and labourer), M. Bernard a general dealer, and the last is the retired Commandant Seltz. No mere labourer is on the council; all are not only ratepayers, but proprietors of some extent of land or house. Almost without exception, the councillors were dressed *en bourgeois*, the blouse being discarded on Sundays and on important occasions. That a village of 186 inhabitants in a poor district, with nothing but a primitive form of depressed agriculture to depend upon, should have produced so respectable a *conseil*, was in itself remarkable. The proceedings commenced by the outgoing mayor, Monsieur Cocu, proposing that the eldest councillor present should take the chair, to which he was voted unanimously. Slips of ordinary paper, torn up for the purpose, were next handed round to each councillor, who, having written thereon the name of his candidate (there was no illiterate voter), folded it and deposited it in somebody's straw hat. The voting resulted in the unanimous re-election of M. Cocu (for the fifth or sixth time, his father before him having been mayor of Vraignes for more than thirty years). M. Bethambeau was almost unanimously elected "adjoint" or vice-mayor.

After the proceedings, we all adjourned to the village café, where, in the course of conversation, I informed the company that neither mayor nor municipal council existed in English villages. I also informed them that, as proprietor of nearly all the land and houses in more than one parish, I had practically to perform a large part of the functions of mayor and council, and to provide all the funds for village improvements and sanitation. These remarks of mine created profound astonishment, but the audience recognised at once the difficulty we should encounter in England of constituting a village council, perhaps largely consisting of non-ratepaying labourers.

In a recent number of the *Economic Journal*, Mr. F. Seebohm remarks, "There never was in France at any epoch a peasantry of labourers working for wages like that of England." It is certainly the case that at Vraignes at the present day, three-fourths of the heads of families are of a class other than, and superior to, mere wage-earning labourers.

The 62 families are made up of :—11 *cultivateurs*, or complete farmers ; 20 *ménagers*, half farmers, half labourers ; 15 labourers (frequently owning house and garden-plot) ; 16 miscellaneous (tradesmen, &c.).

The extent of the territory of the commune of Vraignes is 565 hectares, or nearly 1,400 acres. It is divided into three *sols* or courses, (1) autumn-sown corn, (2) spring-sown corn, (3) fallows, and each farmer is required to have his particular wheat, oats or fallow in the common *sol*. In point of value, the soil of France is divided into three classes. The rates and taxes on the first class amount at Vraignes (as I was informed) to 4f. 50c., or 3*s*. 9*d*. per acre ; on the second class to 3f. 50c., or 2*s*. 11*d*. per acre ; on the third class to 3f., or 2*s*. 6*d*. per acre.

Slightly more than half of the amount collected goes to the State as taxes ; a quarter to the department or county ; and the remainder to the commune. The rates are called *centimes additionelles*, and are levied *pro rata* to the ordinary taxation, but the amount is limited by law according to population. The amount of the rates varies according to the wealth of the commune. The commune of Vraignes is a very poor one, having no other communal property than a chalk pit. Poor-rate, however, is levied nowhere in France.

The average rent of land is now about 20 francs, or 16*s*. per acre, its selling value being about 16*l*.—both being reduced by about one-half in the last fifteen years.

Where a farm-servant is boarded and lodged on the premises, his money wage averages 1*s*. per day. Outside labourers get 2*s*. Harvesting is done by piece-work, 10*s*. an acre being paid for cutting and tying wheat and rye, and about half that sum for oats and barley. All corn crops are mown by hand, and all are sown by hand. Wheat is threshed out by steam, but oats are still knocked out by the primitive flail, of which I heard the old familiar sound in M. de Vismes's barn.

M. de Vismes's yield of wheat per acre has averaged 20 bushels

for the last three years. His oats have yielded nearly double that quantity. The price of wheat averages 47*s.* per quarter. Oats are (May, 1892) all consumed on the premises. But little barley is grown.

Although hardly a single *cultivateur* owns more than part of the land farmed by him, the house and buildings are almost invariably his property. I question, however, whether the Vraignes *cultivateurs* are any the worse off for hiring, instead of owning, a considerable part of their farms. For the rent of land has fallen in Picardy, as well as in England, to about half what it brought in fifteen years ago, and the farmers get the full benefit of the reduction, whereas owners suffer from the depreciation of their capital, locked up in land.

The term *ménager* will probably be as new to the readers of this Journal as it is to me. I seize upon it with considerable avidity, as supplying a much-needed name for the class intermediate between farmers and labourers—a class likely enough to be brought into existence in England through the operation of the Small Holdings Act. The term *ménager* seems to be limited to the former province of Picardy, where it is in almost universal use, implying a villager, possessing house, land, cows, sheep and pigs, farm buildings and hand tools, but not horses, ploughs, nor implements requiring horse-draught. For horse labour, the *ménager* is entirely dependent on the *cultivateur*, who in his turn is largely dependent on the *ménager* for his hand-labour, especially at harvest-time. M. Abdias de Vismes, who is the principal *cultivateur* at Vraignes, makes it an important part of his business to supply horse-labour to the *ménager*, charging 50 francs (2*l.*) an acre for all the operations connected with putting in the wheat crop, including carting it home at harvest. His price is 25 francs per acre for barley and oats.

M. de Vismes volunteered the observation that the *cultivateurs* look upon the *ménagers* as their equals socially, in which view Madame de Vismes entirely concurred. When I remarked that landowners and farmers in England could not see the advantage of labourers having more land than an allotment to cultivate, Madame de Vismes exclaimed, "What an idea! I always said the English were egoist." Had Madame de Vismes been at all acquainted with the conditions of rural life in England, she would, I am inclined to think, have passed a less severe judgment upon us. But, having passed her whole existence in Picardy, where diffusion of property is almost universal, it is not surprising that her economic views should differ widely from ours. It was remarkable, however, and very much to her credit, that as the wife of a considerable yeoman and the daughter of another, she should have looked favourably on the *ménager* class.

The village of Vraignes is about as unlike an English village as any two aggregations of rural dwellings could well be. The most striking difference is the absence of flowers and the rarity of labourers' cottages. What few of the latter exist are mostly of

dilapidated appearance, but appearances are unusually deceptive at Vraignes.

Accustomed as I am to my own three-bedroomed model cottages, I was painfully impressed by the bad state of repair of the labourers' dwellings at Vraignes, and particularly by the very dishevelled state of an isolated mud-and-thatch tenement, on the brink of an abrupt descent, into which it must have fallen before this had it not been propped up by a row of lopped stems of growing trees. It was really more like an overgrown bird's-nest than a human dwelling. In a cellar excavated in the cool chalk bank, undermining the cottage, a well-dressed young woman was seen filling a basket from the family potato store. This young woman was the married daughter of the house, occupied by M. and Madame Laflandre, on a visit to her parents, and was profiting by their superabundance of well-preserved potatoes to eke out her own domestic scarcity. I could read on her countenance the anticipation of her husband's welcome home with her two basketfuls of potatoes.

From the cellar, passing round the house, through a farmyard gate, we mounted to the dwelling-house, where I was surprised to find quite a comfortable interior, consisting of a roomy, clean kitchen, provided with a polished range, and serving as the family sitting-room. Madame Laflandre—bright and cheerful as her daughter, in spite of being the mother of seven children—was seated therein, busily engaged making a white muslin dress for *la première Communion* of one of her daughters. With the habitual cheerfulness of the French peasantry, she remarked : "Nous nous plaisons ici, monsieur." (We like ourselves here, sir.) M. Laflandre, her husband, combines the occupation of woodman with that of farming on a small scale. He owns two cows in milk, ten sheep, two pigs, and twenty-five fowls, and has a yard and buildings. Madame Laflandre is one of the few housewives at Vraignes who still bake at home. She is very proud of her oven and her pastry. Like everyone else in the village, they are well provided with apples.

Almost the entire village of Vraignes, which is very straggling, running down into several hollows as well as standing partly on a high plateau, seems to consist of mud-walled barns and farm buildings mostly in a bad state of repair. Not only each *cultivateur*, but each *ménager*, has an enclosed farmyard, the dwelling-house being seldom visible from the village street. At the back of each group of buildings, of which there must be at least thirty in the village, is a good-sized orchard—sometimes two or three acres in extent, and affording excellent grazing for the cows, of which each family of the *cultivateur* or *ménager* possesses two or three. In his mother's kitchen-garden, leading to their splendid family orchards, M. de Vismes pointed out the plot where his ancestors lie buried—a common practice in France in consequence of the persecution of Protestants.

The fact of the existence of all these yards, buildings, and orchard enclosures, in addition to the training and habits of the French peasants, make much possible in the way of small holdings in France

which we shall be very slow to arrive at in England, if we ever do. Economic conditions, public opinion, legislation, are all favourable to small holdings in France, where land is, after all, still the main source of living, and where land-hunger is still universal. The main object of agriculture in France is still to maintain the larger part of the population on the land. In Great Britain, on the other hand, the dominant consideration, which determines the nature of farming, is the necessity of feeding large centres of town population.

To illustrate the saving habits of the French rustics, let us take for example an old servant named Honoré Mouquet, whom I found cutting up wood in M. de Vismes's farmyard. M. Mouquet, who has been thirty years working for M. de Vismes, farms on his own account six acres of land, owning house and buildings (lately purchased), a cow, six sheep, and two pigs. M. Mouquet's six acres are scattered all over the commune, in about half-acre strips called *parcelles*, or plots, no two of which touch each other—according to the almost universal rule. On one which I visited I found a very flourishing crop of wheat, and a narrow strip of rye grown by Madame Mouquet for the straw to plait into chair-bottoms, on which operation I found her busily engaged the following morning. One of the daughters milks the cow, and attends to the sheep, pigs, and garden; another daughter was handling a pick-axe, assisting in excavating new foundations for supports to the barn, just purchased by her father. Of the six acres farmed by him, M. Mouquet owns absolutely about one-third, hiring the rest. He began by buying quite a small piece of land, a rood or thereabouts, and gradually crept up to his present holding. It is certainly one advantage of the extreme subdivision of land in France that it brings it within the reach of the humblest purchasers.

In spite of the depression of agriculture, the primitive mode of cultivation prevailing at Vraignes, and the inconvenience of the scattering of the *parcelles*, the peasants continue to put money by. I was informed by the Juge de Paix, who resides in the cantonal town of Hornoy, where the Savings Bank is situated, that, every Thursday, depositors troop in from Vraignes. Their savings are mostly made out of butter, eggs and poultry, with which all the numerous farmyards abound. Apples are a considerable source of revenue with all classes. It is an immense advantage that the French peasants enjoy over ours, to be already provided with the plant, as well as the skill, requisite for the production of butter, poultry, and eggs. In respect of subdivision of holdings and the provision of some buildings, the Irish peasants enjoy advantages similar to the French, but they are wanting in the skill and thrift to which the French owe their success. For the system of small farming in France, which admits of putting money by in the present day, must be entitled to be considered to some extent a success.

If it is objected that it is protection which enables the French small holders to save, I think I can show that the objection is not valid. For the larger farmers, whose energies are mainly directed to producing cereals and meat, the articles specially protected, have

suffered fully as much as farmers of the same class in England. In fact I am informed by M. de Vismes that not less than ten of his yeoman-farmer acquaintances at Vraignes have been sold up within fifteen years—a result, however, which he attributes to drinking habits as much as to agricultural depression. M. de Vismes himself, by hard work and strict economy—he does not, for instance, keep even a servant girl, Madame de Vismes doing all the housework herself—manages to make both ends meet. But he remarked : "We are the slaves of our harvests."

By universal consent, it is the *ménagers*, or half farmers,[1] who hold their own in Picardy, and that, mainly, by dairying, poultry, and orchards, none of which industries are much helped by protection. If small holdings are ever to be successful in England, they must be conducted on much the same lines as they are in Northern France. But, as I remarked above, the French peasants compete with the British, with the immense advantage of hereditary skill, thrifty habits, holdings already small and provided with extensive buildings and yards, and orchard enclosures.

All over France, every kind of animal, including sheep, for eight months of the year, is confined in buildings, within the farmyard, at night. The sheep manure, made under cover, is greatly esteemed in Picardy. From July 1 to November 1, the sheep of those *cultivateurs* and *ménagers* who belong to *La Herte*, are night-folded on the land of those who contribute sheep. *La Herte* is strictly a co-operative association, now consisting at Vraignes of four *cultivateurs* and seven *ménagers*, contributing amongst them 198 sheep to the common flock, of which there is but one in the village. In larger communes there would be two or more. The shepherd is in the pay of *La Herte*, which owns in common the hut which shelters him at night, the sheep hurdles, water-trough, and all the requisite plant.

The right of *vaine pâture*, or grazing over the whole communal territory, everywhere except in growing crops, exists in full force all the year round, and not only after harvest. The visits of the flock are much appreciated on the fallows, both for their manure and for keeping down the weeds, but the shepherd occasionally gets into trouble by allowing his sheep to stray into the standing clover. It is surprising, however, how well the sheep are trained to keep to the waste ground or fallows. Their habits, indeed, seem as thrifty as those of the peasants themselves.

The arrangements for the division of the night-foldings on the land of the different members of *La Herte* are somewhat complicated and sometimes the subject of disagreements, which have to be referred to the prefect of the department for settlement. Quite recently, for instance, the prefect was called on to decide whether the number of night-foldings allotted to each should be determined exclusively by the proportion of sheep contributed, or whether the

[1] I am indebted to a friend for the suggestion of the term "husbandman" as the English equivalent of *ménager*.

number of acres farmed should also be taken into account. His decision (opposed to M. de Vismes's desire) was to the effect that the land, as well as sheep, was to be included in the calculation, which is made as follows :

Of the total of four months of nights from July 1 to November 1, viz. 122, one half, or 61, are allotted to the total of acres, viz. 414, farmed by the contributories ; and 61 to the total of sheep, viz. 198. Thus one night's folding is assigned to every $6\frac{3}{4}$ acres, and to every $3\frac{1}{4}$ sheep, giving to M. de Vismes, who contributes 99 acres and 36 sheep, a total of 25 nights, with which he heads the list. Our acquaintance, M. Laflandre, of the dilapidated cottage, is at the bottom with 12 acres and 10 sheep, yielding him five nights. The further knotty question of the season, whether to be of short summer or longer autumn nights, is determined by lot.

La Herte is probably as old an institution as *La Vaine Pâture*, so much insisted on by Mr. Seebohm as evidence of the former prevalence of the common field system of agriculture in France.

Before closing this paper, I will ask the reader to glance with me for a moment at the commune of Talmas, some ten miles to the north of Amiens and thirty miles distant from Vraignes. Talmas, to all appearance, is a paradise of small holders. As at Vraignes, labourers' cottages are rare ; but the number of farm buildings, yards, orchards, and small paddocks (well fenced round and shaded by trees) seems almost infinite. Talmas is about five times the size of Vraignes, which it resembles in its main features, with the exception of its network of small paddocks, in addition to its orchards. Its highways and byways in the late afternoon of a sunny day in May, when I visited Talmas, swarmed with cows and heifers, mostly conducted in pairs, a rope in each hand, by very old or very young people.

But, in spite of its ideal surroundings and conveniences for small holdings, the population of Talmas has fallen in the last six years from 1,113 to 913. This diminution is partly to be accounted for by the attractions of a factory lately started in a neighbouring commune. But the migration from the country to the towns is unfortunately on the increase in Picardy, as in the rest of France, in spite of small holdings.

It will be gathered from the above description of Small Holdings in Picardy that the peasants are by no means invariably proprietors of the entirety of their holdings. It seems commonly to be the case that the acres which the peasant inherits or purchases appear to be a sort of nest-egg, attracting other acres which he hires.

It is hardly possible to exaggerate the inconvenience of the fact that hardly any two *parcelles*, belonging to the same owner, are contiguous. This was the case with Homer Dersent of Talmas, whom I found ploughing in manure on one of his half-acre *parcelles*. He could hardly point me out another within sight which belonged to him. He informed me that he owned ten of his acres, and hired the remainder of five or six different landlords. He also hired his house buildings and orchard at the very low rent of 4*l*. In Picardy

certainly—and I have little doubt all over France—owning, hiring, and farming as family representative are so exceedingly mixed up, that the term "peasant proprietor" is very far from being an accurate term to apply generally to French cultivators.

Satisfactory as it is to see the *ménagers* doing well and saving, and adding rood to rood, it is a very serious state of things to find the class of yeoman-farmers or *cultivateurs* of from 40 to 100 acres breaking down in Northern France, in spite of "protection." For several years preceding 1890, wheat paid an import duty of 5 francs the quintal (100 kilogrammes), equivalent to about ten shillings a quarter. In consequence of the failure of the wheat crop in the north of France in 1891, the French Chambers, dreading a scarcity, reduced the duty from 5 francs to 3 francs per quintal, for one year only. The 5-franc duty per quintal is again in force since June 1, 1892. During the four years' (1887–1891) prevalence of the unreduced duty, the price of wheat averaged only 1 franc per quintal (or about two shillings per quarter) higher than during the year of the reduction of the duty from 5 francs to 3 francs.

The complaints of the scarcity and deteriorated quality of labour on the part of the few large farmers whom I came across in Picardy are even louder than in England. The facilities for acquiring small bits of land in France are so widespread, that almost every steady labourer in the country—in Picardy at all events—becomes the owner of an acre or two before he reaches middle age. The large farmers have to put up with the improvident and inferior labourers, who alone will engage themselves by the year. Their relations with their men are so strained, and the times are so bad, that large farms are hardly to be let at any price. A farm at La Roselle, near Douliens, formerly let at 14,000 francs, is now offered at 5,000 francs. In a commune like Vraignes, where there are no large farms, and where the moderate-sized farmers, *ménagers*, and labourers (hoping to become *ménagers*) are mutually interdependent, the relations are excellent.

As the landlords in France, very often notaries, are nearly always non-resident, and are seldom persons in a position to take land into their own hands, the condition of agriculture on the large scale, where cereals are the main crop, is even more critical than in England. In the sugar-beet growing district around Peronne, where sugar factories abound, with light railways to feed them, the outlook is much more hopeful.

Since writing the above I have had the advantage of reading the paper on "Small Holdings in Cornwall," by Mr. J. W. Lawry, in this Journal (vol. iii. part ii., 1892, p. 390). I venture to think that Cornwall, with its exceptionally mild climate, can hardly be taken as a fair sample of what can generally be achieved in Great Britain by small holders. But the success as yet obtained even there does not seem very considerable.

I have myself been carving small holdings off large farms in Cambridgeshire for twenty years, and offering them at the same rate

as, or at a very slight advance on, the large farm rent, but do not find them applied for, as yet, by labourers pure and simple. My small holders, almost without exception, have some second string to their bow besides agriculture. I am convinced, however, that small holders have a great future before them, as soon as they can be educated up to producing such articles as require to be consumed fresh, and will not bear long carriage.

W. H. HALL.

RECENT AGRICULTURAL INVENTIONS.

The subjects of Applications for Patents from June 10 *to Sept.* 17, 1892.

N.B.—Where the Invention is a communication from abroad, the name of the Inventor is shown in italics, between parentheses, after the name of the applicant.

Agricultural Machinery and Implements, &c.

No. of Application. (Year 1892)	Name of Applicant.	Title of Invention.
11103	RANSOME & GARRARD	Hay-making machines.
11140	PERKINS, J.	Potato ploughs.
11202	HILL, T.	Hay maker and gatherer.
11255	WALLACE, A. B.	Mowing machine.
11414	SARGEANT, T. C.	Horse hoe.
11422	KEIGHLEY, E.	Turnip-cutting machine.
11561	STEVENS, T.	Cleaning or dressing barley, &c.
11774	STEWART, T. & R.	Riddle.
11918	MCCAUSLAND, W.	Cleaning grass-seed.
11943, 11944	HEID, N.	Cylinder apparatus for separating grain from impurities.
12011	FULLARD, W.	Reaping machine.
12013	HORNSBY & INNOCENT	Sheaf packing and binding mechanism.
12090	THOMSON, J.	Drill, and dung spreading and distributing machine.
12171	HARRIS, R. J. & C. J.	Mowing and reaping machines.
12179	KOHLERT, C.	Ploughs.
12230	TOPP, G. C.	Reaping and mowing machines.
12404	PETERS, J. and anr.	Hay-rick tester.
12430	CARTER, J. P.	Ear lifter to be attached to reaping machines.

No. of Application	Name of Applicant.	Title of Invention.
12448	Lidgerwood, W. V. V.	Machine for hulling grain.
12483	Mawle, H. D. .	. Ploughs.
12573	Blyth, E. L. T. .	. Hay-raking machine.
12612	Drouilly, J. L. .	. Machine for mowing, clearing, raking, &c.
12748	Edlington, J. B. & T.	Horse hoes.
12863	Sargeant, T. C. .	. Sheaf-binding harvesters.
12900	Jankowski, L. .	. Reaping or mowing machines.
12929	Huxtable, J. .	. Portable horse rakes.
13026	Pogson, E. F. .	. Stacking forks.
13151	Pichno, W. . .	. Rotary plough.
13621	Bramley, W. A. .	. Ploughs.
13890	Heath, W. . .	. Improved tread for digging-fork
13976	Gasser, S. . .	. Cultivators.
14616	Clark (*Bajac & anr., France*) . .	. Machine for cutting straw for fodder.
14704	Fell, W. A. .	. Reaping and mowing machines.
15727	Gray, W. . .	. Ploughs.
15728	Do. . .	. Feeders for threshing machines.

Stable Utensils and Fittings—Horse-shoes, &c.

11138	Booth & Roberts	. Horse-shoes.
11509	Grammer, J. .	. Shaft-tugs.
11510	Moodie, T. S. .	. Harness attachment.
11534	Fell, W. T. . .	. Horse-collars.
11667	Clapham, R. H. .	. Reins.
11802	Lea, C. . . .	. Horse-shoes.
12022	Schweim, C. J. .	. Curry-combs.
12357	Armstrong, J. & W.	. Tug suspender for harness.
12542	Bouchard . .	. Horse-shoes.
12545	Hill, S. . .	. India-rubber pads.
12945	Brown-Cave, R. .	. Ointment for splints, curbs, &c.
12753	Albert, A. . .	. Horse-shoes.
13248	Edlington, J. B. & T.	. Harness.
13896	Dade, H. S. . .	. Horse-shoe appliance to prevent slipping.
14207	Wilton, H. S. .	. Horse-shoe pads.
14701	Bailey, C. I. C. .	. Horse-collar.
14729	Head, J. E. . .	. Safety stirrup-bar.
14884	Owen, S. A. . .	. Horse-shoes.
14955	Beale, W. . .	. Horse-shoe pad.
15189	Bull . . .	. Horse-shoes.

No. of Application.	Name of Applicant.	Title of Invention.
15215	WILTON, W. P. . .	Side-saddles.
15493	GROVES, F. & DEARE, F.	Safety flanged horse-shoe.
15622	THOMPSON (*Pivetta, Italy*) . . .	Horse-shoe pad.
15957	GROVES, F. & DEARE, F.	Steel studded grip horse-shoe.
16028	BIRKBECK, H. (*Hühn, Germany*) . . .	Holding apparatus for horses.
16147	STEWART, W. . .	Padding of horse-collars, &c.

Carts and Carriages.

14078	MCDOUGALL, A. & R. .	Wheels for carts, &c.
14249	LONES, J. and others .	Tyres of wheels of waggons, &c.
14350	RYDILL, G. . . .	Fixing tyres to carts, &c.
14690	STEWART, W. . .	Wheels for carriages, &c.
14803	BAYLEY, A. E. . .	Tip waggons and carts.
15363	JENKINS, W. J. and ors.	Combination waggon, tail-board, and hoist.
15374	DICKMANN, K. H. .	Wheel protectors for carriage axles.
15625	THOMPSON (*Frantz, Germany*) . . .	Tip waggons.
11543	SMITH, J. H. . .	Brake apparatus for two-wheeled vehicles.
12714	BELLINGHAM, G. J. .	Cart, &c., wheels.
12910	DAVIS, G. . . .	Improved cart-wheel.
13209	MENDEL, A. . . .	Poles and shafts for two horses abreast.
13369	WUNDERLICH, H. . .	Spring device for splinter bars.
13536	LEMOINE, J. . . .	Carriages.
13988	BALDWIN, R. G. . .	Convertible victoria or brougham.

Dairy Utensils, &c.

13031	HEDGES, C. . . .	Device for cleaning out churns, &c.
13671	GORNALL, J. . . .	Cheese-maker.
13739	SEWELL, R. B. and others	Package for butter, &c.
13810	STRUTHERS, J. T. . .	Milking appliances.
15073	MCDOWELL, J. . .	Churns.
15273	WILLIS, P. (*Lonnergran, U.S.A.*).	Ascertaining the quantity of butter-fat in milk.
15443	LANDER, S. T. . .	Butter-rolling machine.
15735	GEIGER, A. . . .	Churn.
16464	BENSON, J. . . .	Simultaneous straining and aëration of milk for use of cheese-makers.

Poultry and Game, &c., Appliances.

No. of Application.	Name of Applicant.	Title of Invention.
1291	FERNYHOUGH, H. G.	Poultry fountains.
14501	WINCHCOMBE, W. B.	Heating incubators, &c.

Miscellaneous.

12060	THOMPSON, W. P. (*Gayman, U.S.A.*)	Cure for foot-rot in sheep.
12905	HOTHERSALL, W. F. and TURNER, F.	Dog kennels.
13296	HORN, W. W. (*Hall U.S.A.*)	Mangers.
13660	WATERHOUSE, T. G.	Water-holder for dogs and poultry during transit or at shows.
13695	VAN MULLEM and others	Cattle food.
14649	FLETCHER, H. H.	Preventing rats getting into grain sacks.
15055	TURNBULL, T. O.	Ear clip for marking stock.
15134	MYATT, J.	Sheep-dipping apparatus.
16098	PORTER, T. W. and CROSS.	Oil-cake and feed-cake press.
16288	TWIGG, G.	Shears for sheep-shearing, &c.

Numbers of Specifications relating to the above subjects Published since June 11, 1892.[1]

Specifications of 1891.

4944, 9649, 10712, 11751, 12092, 12319, 12502, 12608, 12835, 12874, 12931, 13018, 13212, 13227, 13263, 13332, 13505, 13515, 13580, 13997, 14266, 14629, 14632, 14644, 15007, 15151, 15352, 15392, 15636, 15666, 15931, 16376, 16736, 16848, 16998, 17072, 17141, 17225, 17945, 17984, 18130, 18892, 18968.

Specifications of 1892.

4100, 4615, 5650, 6233, 7456, 7762, 7768, 8210, 8264, 8371, 8419, 8873, 8990, 8994, 9328, 9374, 9560, 9667, 10371, 10952, 11172, 11419, 11460, 11995, 12022, 12230, 12542, 12941.

[1] Copies (price 8*d.* each, post-free) may be obtained at the Patent Office (Sale Branch), 38 Cursitor Street, London, E.C.

STATISTICS AFFECTING BRITISH AGRICULTURAL INTERESTS.

Summary of Agricultural Returns of Great Britain for 1892.

Note.—The Returns were collected on June 4 in the Years 1890, 1891, *and* 1892.

Acreage of Land in Great Britain under—

Year		Wheat	Barley	Oats	Potatoes	Hops
		Acres	Acres	Acres	Acres	Acres
1890		2,386,336	2,111,178	2,902,998	529,661	53,961
1891		2,307,277	2,112,798	2,899,129	532,794	56,142
1892		2,219,839	2,036,810	2,997,545	525,361	56,263
1892 compared with 1891	Increase	—	—	98,416 or 3·4 per cent.	—	121 or 0·2 per cent.
	Decrease	87,438 or 3·8 per cent.	75,988 or 3·6 per cent.	—	7,433 or 1·4 per cent.	—
1892 compared with 1890	Increase	—	—	94,547 or 3·3 per cent.	—	2,302 or 4·3 per cent.
	Decrease	166,497 or 7·0 per cent.	74,368 or 3·5 per cent.	—	4,300 or 0·8 per cent.	—

Number of Cattle in Great Britain.

Year		Cattle			
		Cows and heifers in milk or in calf	2 years old and above	Under 2 years old	Total
		No.	No.	No.	No.
1890		2,537,990	1,439,119	2,531,523	6,508,632
1891		2,657,054	1,504,649	2,691,118	6,852,821
1892		2,650,891	1,666,706	2,627,186	6,944,783
1892 compared with 1891	Increase	—	162,057 or 10·8 per cent.	—	91,962 or 1·3 per cent.
	Decrease	6,163 or 0·2 per cent.	—	63,932 or 2·4 per cent.	—
Increase in 1892 compared with 1890		112,901 or 4·4 per cent.	227,587 or 15·8 per cent.	95,663 or 3·8 per cent.	436,151 or 6·7 per cent.

Number of Sheep and Pigs in Great Britain.

Year		Sheep and Lambs: Sheep	Sheep and Lambs: Lambs	Sheep and Lambs: Total	Pigs
		No.	No.	No.	No.
1890		16,756,568	10,515,891	27,272,459	2,773,609
1891		17,786,941	10,945,617	28,732,558	2,888,773
1892		17,957,049	10,777,655	28,734,704	2,137,859
1892 compared with 1891	Increase	170,108 or 1·0 per cent.	—	2,146 or 0·0 per cent.	—
	Decrease	—	167,962 or 1·5 per cent.	—	750,914 or 26·0 per cent.
1892 compared with 1890	Increase	1,200,481 or 7·2 per cent.	261,764 or 2·5 per cent.	1,462,245 or 5·4 per cent.	—
	Decrease	—	—	—	635,750 or 22·9 per cent.

Table showing the Acreage under Hops in England, as returned upon June 4, in the Years 1890, 1891, and 1892.

Counties	1890	1891	1892	Counties	1890	1891	1892
	acres	acres	acres		acres	acres	acres
Berks	11	11	10	Suffolk	25 [1]	20	22
Gloucester	11 [1]	25	39	Surrey	1,874	1,955	1,938
Hants	2,614	2,749	2,775	Sussex	6,787	7,150	7,124
Hereford	6,077 [1]	6,560	6,797	Worcester	2,925 [1]	3,280	3,369
Kent	33,525	34,266	34,058				
Notts	14	14	14				
Salop	98 [1]	112	117	Total	53,961 [1]	56,142	56,263

[1] These acreages do not agree with those given in the "Agricultural Returns" of 1890, owing to 3 acres in the county of Gloucester and 4 acres in the county of Suffolk having been originally returned in error, and to the returns for parts of the counties of Hereford, Salop, and Worcester having been originally made in hop acres instead of statute acres, causing a reduction of 442 acres in Hereford, 12 in Salop, and 133 in Worcester.

JOURNAL

OF THE

ROYAL AGRICULTURAL SOCIETY
OF ENGLAND.

COTTAGE SANITATION.

Prefatory Note.

THE following paper is the outcome of a meeting held on October 29, 1892.

Having been consulted on the question by Earl Cathcart, Chairman of the Journal Committee, I thought it best to take counsel with some gentlemen who are technically engaged at the present time in guiding sanitary work, rural and urban.

There met me at my house:—

MR. R. N. HARTLEY, Lecturer on Hygiene in the Yorkshire College, Leeds;

DR. SPOTTISWOODE CAMERON, Medical Officer of Health to the County Borough of Leeds;

DR. WHITELEGGE, Medical Officer of Health to the West Riding County Council;

DR. MITCHELL WILSON, Medical Officer of Health to the Doncaster Combined District;

MR. F. ATKINSON, Medical Officer of Health to the Craven Combined (Rural) District, and

MR. ERNEST CLARKE, Secretary to the Royal Agricultural Society.

After a long discussion of the various points that ought to be dealt with in such an essay, notes of which were taken by Mr. Clarke, it was arranged that Dr. H. McLean Wilson should be invited to write a paper embodying the views agreed to at the meeting, under the supervision of Dr. Cameron and

myself. Dr. Wilson has been engaged for the last year with Dr. Cameron in the practical study of sanitary work in Leeds, having been previously for seven years in private practice in the rural district of Penrith.

The aim of the paper is to make suggestions of as simple a kind as will meet the necessity of each case, and to set forth a minimum of sanitary requirement such as may reasonably be attained in every country village.

Small towns and the larger villages have probably a sanitary machinery by which such improvements as are here suggested could be set a-going, but doubtless there are numbers of small villages in which there is a want of initiating power to secure, from those authorised to make it, a systematic house-to-house inspection of these elementary sanitary requirements.

For these villages, might it not be possible to form small volunteer committees? Such a committee might be composed of a member of the squire's family, the clergyman, a Nonconformist minister, the doctor, a tradesman, and one or two of the most intelligent cottagers. This committee, aided by the medical officer of health, could draw up a series of requirements suited to the particular village, and then could visit every house and try to persuade each cottager to carry out the necessary rules and arrangements.

Committees of this kind would be of value in educating the members of the committee, in educating the villagers, in raising the standard of sanitary habits, and in bringing about a position of greater safety, should cholera or any other epidemic gain a footing in the country.

T. Pridgin Teale.

As it is now some time since much notice has been taken by the newspaper press of the cholera epidemic, it might appear needless to speak of taking any special precautions in the expectation of an outbreak in our midst. But it is impossible for anyone who has studied the course of former epidemics not to fear that such evil fortune may yet be in store for us. On former occasions the disease has advanced from the far East through the Continent during one year, only a few cases occurring in our own country: at the approach of winter its severity has diminished, but on the return of spring it has burst out afresh and with renewed vigour, spreading rapidly on our side of the Channel.

It is true of this as of most other infectious diseases, that every case must have its rise in some previous one, so that if

we could prevent the introduction of any case of cholera or any cholera-infected material into the country we should be perfectly sure of escaping the disease. But this is impossible in the present day, when there is so much intercourse and commerce between this country and the Continent.

Therefore the obviously proper method to pursue is, while trusting that the central and port sanitary authorities will do their best to keep out the disease, to put the whole country, and every house in the country, into such a condition that if the epidemic should break out it would have no chance of spreading.

About the fact that cholera is the result of a germ which can increase and multiply in collections of filth, in polluted water supplies, and the like, there is now no doubt. But it is also recognised by all medical authorities that infectious diseases have their fatality much increased by anything unwholesome in the surroundings of a patient, and that unhealthy surroundings greatly increase the liability of any person to contract the disease when the infection is present. It is, therefore, every man's duty, in the first place, to set his own house in order, and, in the second, to see that his neighbour does the same.

In country districts and villages there are still—especially in the houses of the working classes—an enormous number of evils to be remedied. Landowners, farmers, and others interested in the welfare of the agricultural labourer should give him what help they can in this direction, both for his sake and for their own. For while, on the one hand, he has not the knowledge nor the means to make the necessary improvements, on the other, any infectious disease which occurs in his family is sure to spread to the homes of his neighbours.

The principal sanitary defects in the house of the agricultural labourer, regarded as a dwelling for a family, may be arranged under one or other of the four following heads:—

I. *The situation, construction, and condition of the house itself.*
II. *The mode of disposal of house refuse and nightsoil.*
III. *The water supply.*
IV. *The habits of the occupants.*

Each of these heads will be considered in detail, and for the commoner sanitary defects which come under each, their appropriate remedies will be described. It is scarcely necessary to say that in no case is it claimed that the remedy suggested for any evil is the only one, nor even that it is always the best. It is hoped, however, that in each case it is a simple, an effectual and, above all, a practicable one.

I. Defects arising from the Situation, Construction, or Condition of the House itself.

This heading might be made to include almost the whole of cottage sanitation, but here it is meant to cover conditions of site and structure of the house itself, and even then the defects classed under it require further subdivision into smaller groups.

(1) **Unsuitable sites.**—Cottages are often built in most improper places. They stand, for instance, in damp hollows. They are built into excavated hillsides. They are erected on land undrained, perhaps waterlogged.

In fig. 1 an attempt has been made to represent a house built on a porous soil, soaked with water which percolates from

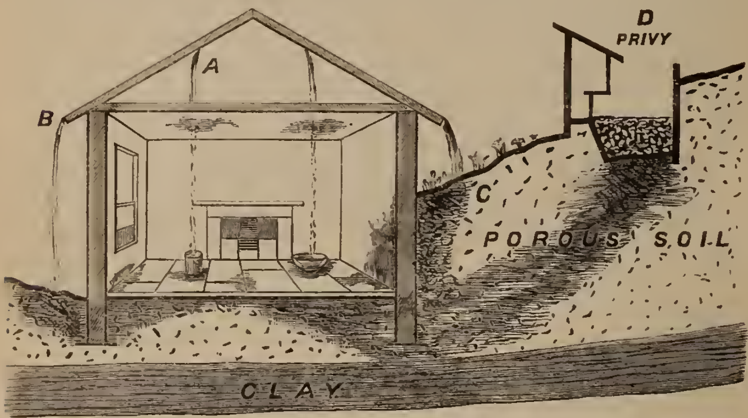

Fig. 1.—Cottage, damp from A, roof leaking into ceiling; B, unguttered eaves; C, soil against outer wall, wet with soakings from garden and privy midden; D, privy midden above level of ground floor.

higher ground above, but cannot get away on account of an impervious layer below.

The soil is heaped up against the back wall of the house to a height of several feet above the floor level, so that both the floor and wall are kept continually damp. Too often this higher ground behind is the cottage garden, plentifully manured every spring; or, worse still, it is the site of the midden or pigsty. Hence it is by no means always pure water which causes the dampness.

It is scarcely necessary to remind the reader that houses ought not to be built upon sites which have been "made" by depositing rubbish containing animal or vegetable refuse.

(2) **The want of eave-spouting.**—In the same figure is shown what follows from the want of eave-spouting. The rain from

the roof, running down the walls of the house or dropping from the eaves, soaks into the foundations and keeps the ground floor continually damp and unwholesome.

(3) **Leaking roofs.**—Very often, too, the roofs of the cottages are not watertight, and besides the discomfort from the wet in rainy weather, there results a continuing danger from the wetness of the walls soaked by the rain.

(4) **Ground damp.**—The walls may also be rendered damp by the moisture which rises through them from the ground. This is especially the case in some of the older cottages where the interspaces of the walls have been filled up with earth, a practice

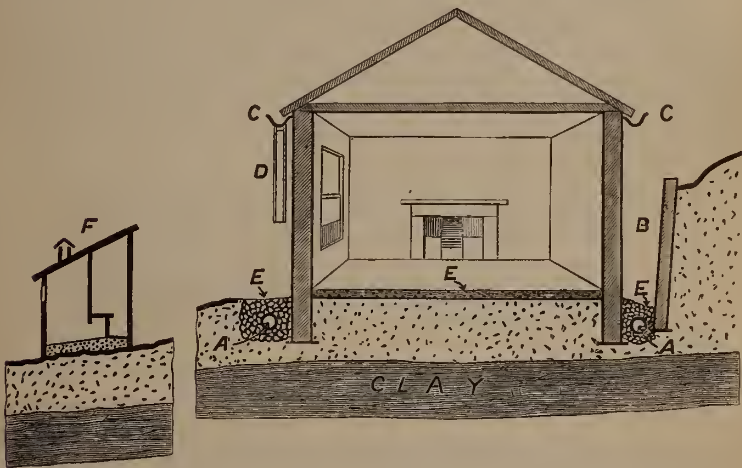

FIG. 2.—Remedies applied to fig. 1. A, drain surrounded by rubble; B, air-space round the house; C, rain gutter; D, fall pipe; E, concrete surface; F, privy removed to lower level.

which seems at one time to have been very common in some parts of the country.

(5) **Wet walls.**—The walls are sometimes made of very pervious material, or they let the rain penetrate by the joints.

REMEDIES.—The remedies for these defects are simple, and are enumerated in the same order.

(1) **For a damp site.**—A damp site should be well drained. An ordinary tiled drain, with rubble around it, should be laid all round the outside of the house at least six inches beneath the floor level and within a foot or two of the wall. In some cases this should be carried under the floor. The ends of the drain should be open to the air, covered simply by a grating.

All the soil should be taken away from around the house wall below the floor level, a free air space of at least a yard being

left all round; and this should be done in such a way as to leave sufficient slope for the speedy removal of surface water.

Where there is an ordinary house drain for sewage, it should not communicate with these subsoil-water drains.

The surface of the ground immediately around the house should be concreted, paved, or macadamised, and sloped so that rain water may flow off without penetrating.

The floor of the house should always be of some impervious material. Concrete is best, and the next best is good hard sandstone set in cement. The floor should be a little above the level of the ground outside.

Where a boarded floor is desired, there should be a space between the concrete and the boards freely communicating with the open air to prevent dry rot. This space is sometimes difficult to obtain, and Mr. Councillor Hannam, of Leeds, has suggested and carried out the plan shown in fig. 3, whereby a concrete surface can be boarded over.

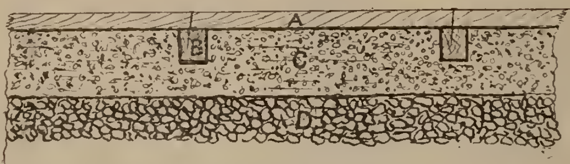

Fig. 3.—Concrete floor with boarded surface. A, floor boards; B, slips 2″ × 1½″; C, cement concrete 4″ thick; D, rubble.

The ground is first prepared with rubble, on which is laid two inches of cement concrete. Wooden slips 2″ × 1½″ are then laid about a foot apart, and the spaces between filled with cement concrete so as to make a level surface. To the slips the flooring is nailed. The writer has seen the basement of a house in Leeds in which this plan had been carried out. The result is excellent.

(2) **For want of eave spouting.**—The roof of the cottage should be properly guttered, and have a fall-pipe to conduct the water either to a cistern or to a channel which conveys it away from the foundations of the house. Fig. 2 on p. 635 shows some of these improvements.

(3) **For a leaking roof.**—The roof should be made water-tight. It is hardly within the scope of this paper to discuss the merits of the various methods of roofing. Thatched, tiled, and slated roofs may be all perfectly good if they are kept in good repair. Thatch requires frequent renewal, and should never be allowed to get moss-grown or grass-covered.

(4) **For ground damp.**—There is only one way of preventing

ground damp, which is generally too costly to be applied to cottages already existing—a damp-proof course in the walls.

In building new houses there should always be such a course, just below the floor level, but above the level of the ground outside, so as to prevent the ground water from rising in the walls. There are several forms of this, and amongst the best is a course of glazed bricks or slate set in cement, or a layer of asphalte.

A damp-proof course may be inserted in the wall of a standing cottage, when it is a valuable one, by the method of "underpinning." The measures available against damp sites are also of service against ground damp where a cure is impossible.

(5) **Wet walls.**—Where rain penetrates the walls simply by beating against them, it can be kept out by slating, or boarding, or by coating the wall with tar or paint or a layer of cement, on the outside. Cement, rather than mortar, should also be used for pointing walls which are specially exposed to the weather.

To line damp walls internally with wood is worse than useless. The boarding conceals the stain, and retards the drying of the wall.

II. The Disposal of House Refuse and Nightsoil.

Indifference to this matter is far too common. The fresh air in which country people live all day so lessens the evil effect of the foul air within and round their dwellings that they can scarcely be got to believe, even when fever breaks out, that the cause is so near them as it evidently is to the eye of the physician and the sanitarian.

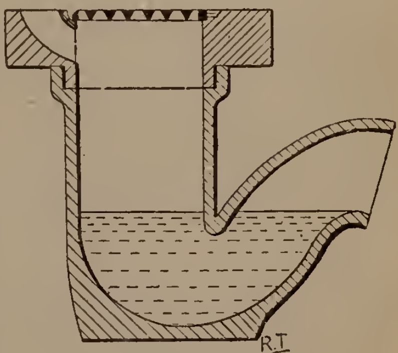

Fig. 4.—Trapped gully. (See page 638.)

(1) **Slop water.**—One of the commonest sanitary defects in cottages is the want of a proper method of disposal of the slop waters. These are often thrown into an open drain dug in the soft soil, where they in time wash out a hole, which remains always full of the foul and fermenting liquid; or they are thrown on the top of the midden, causing a similar nuisance.

It is a question for discussion whether sinks should be pro-

vided in cottages. Probably they should be so only where there is a tap above them with a copious supply of water.

Where there is a sink it must be placed against the outer wall of the house, the pipe leading from it must be trapped with an ∽ bend and must then pass directly through the wall to the outside of the house, and be cut off so as to deliver in the open air.

Whether there is a sink or not, there should always be provision for immediately carrying all dirty water away from the vicinity of the dwelling. The simplest form of this, and one perfectly good for an isolated house, is an open channel. This must be constructed of impervious material—glazed bricks or concrete, or, best of all, glazed half pipes made for the purpose—so that the water does not lodge anywhere.

Should the sewage run into a cesspool or sewer, a trapped gully must be provided with a drain of glazed pipes 4 inches in diameter. If there is a sink, its pipe should deliver over this gully on to a dish stone or into an opening leading beneath the grating, as shown to the left hand in fig. 4 on page 637. The object of the trap is to prevent gases from the drain from getting out near the dwelling.

The best method of disposing of the sewage is to run it on to the land, distributing it over a large surface by a shallow ditch, the course of which is changed from time to time, so that the soil does not become saturated.[1]

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[1] As corroborative of the conclusions on the subject of the disposal of slop water, formulated by the writer of the paper, it may be interesting to record some recent experiences in a purely agricultural Buckinghamshire village. The nonagenarian Sir Harry Verney, the "father" of the Royal Agricultural Society, has, during the whole of his long and active life, laboured for the improvement of the condition and surroundings of the agricultural labourer, and in this work he has had the powerful support of his distinguished relative, Miss Florence Nightingale.

On his estate at Claydon, Buckinghamshire, Sir Harry Verney has recently carried out extensive improvements in the sanitary condition of some of his cottages, and the alterations have, for the most part, been in the directions indicated in Dr. Wilson's paper. As neither the neighbouring landowners nor the rural sanitary authority could be induced to formulate a joint scheme for the sanitation of the villages, Sir Harry Verney has been carrying out improvements affecting some of his own cottages entirely at his own expense.

The principal changes that have been introduced are, the carrying away in pipes of the slop water from the cottages into main sewers, and the immediate removal, also in pipes, of the liquid that runs from the pigstyes at the back of the cottages. Sinks have been fixed against the outer wall of the houses, and are properly trapped. The pipes are socket jointed, and percolation of the sullage water into the soil surrounding the well (which unfortunately is sometimes at the back of the cottages, and near the drains) is thus prevented. The pipes from the different sinks are conveyed in separate channels until some distance from the cottages, when they open into well-constructed brick inspection chambers, through which the drainage is carried in the glazed half-

(2) **The closet and midden.**—Perhaps the commonest form of convenience attached to country cottages is the privy-midden—a good enough arrangement when properly constructed at some distance from the house and frequently emptied. But unfortunately its contents are often allowed to accumulate for months or

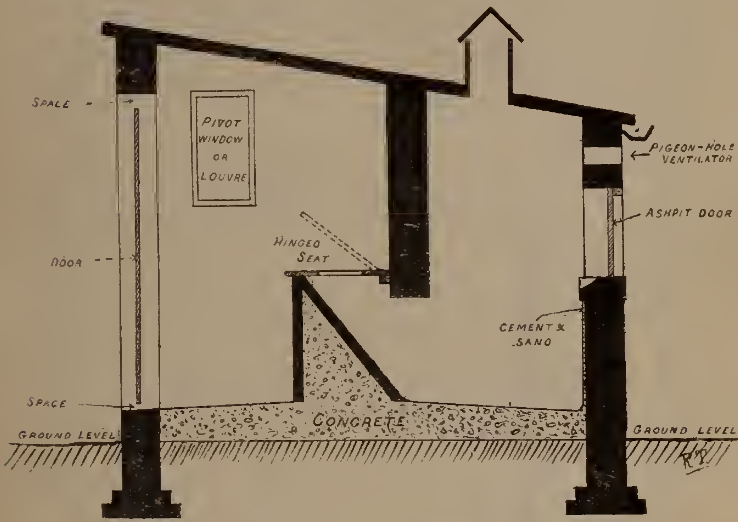

FIG. 5.—Plan of Privy-Midden.

even years. The writer has known one attached to a school which had not been emptied for several years, attention being drawn to it by the fact that many of the scholars were in bad health.

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pipes referred to in the text, and which are admirably laid in cement. It is possible in this way to ascertain at once, in the case of stoppage of drainage, exactly in which pipe the obstruction occurs. Ventilation of the chambers and drain-pipes is provided for by separate air inlets. The liquid that runs away from the pigstyes is carried into these drains by a similar arrangement of sinks and traps.

The whole work has been constructed in a very perfect manner, and the drainage is carried away into main channels, which empty themselves on to grass land at a sufficient distance from the cottages. Other inspection chambers are provided at the entry of the smaller drains into the main ones. Formerly, the refuse from the pigstyes was put into a kind of cesspool by the side of the sty, and owing to the scarcity of material for litter, the greater part of the liquid used to soak into the earth, and no doubt in some cases found its way into the wells. Wherever it has been possible, the drains have been taken far away from the wells. The replacement of cesspools by the earth-closet system is now in progress, but the difficulty with a soil such as that at Claydon (which is mostly heavy clay) of providing sufficiently fine and dry earth for absorption purposes is likely to be a source of considerable trouble.—ERNEST CLARKE.

Figure 5 shows a plan for a privy-midden according to the following Model Bye-laws of the Local Government Board.[1]

Every person who shall construct a privy in connection with a building shall construct such privy at a distance of *six feet* at the least from a dwelling-house or public building.

[This distance is a minimum for towns; in the country a much greater distance could generally be obtained and would be desirable.] . . .

So as to afford ready means of access for cleansing without the filth being carried through any dwelling-house or public building. . . .

Shall provide such privy with a sufficient opening for ventilation. . . .

Shall cause the floor to be flagged or paved with non-absorbent material, and construct such floor not less than *six inches* above the surface of the ground adjoining. . . .

If in combination with a movable receptacle [such as a pail], shall construct over the whole area of the space beneath the seat a flagged or asphalted floor, not less than *three inches* above the level of the ground adjoining, and shall construct the wall between this floor and the seat of flagging, slate, or brickwork at least *nine inches* thick, and rendered in cement or asphalted. . . .

He shall construct it so as to admit of a movable receptacle of a capacity not exceeding *two cubic feet* being fitted beneath the seat, so as to prevent the deposit of any filth elsewhere than in the receptacle.

Every person who shall construct a privy in combination with a fixed receptacle for filth [a privy-midden], shall fix in connection with such privy suitable means for the effectual application of ashes, dust, or dry refuse to any filth deposited in such receptacle. . . .

So that the contents of the receptacle are not exposed to any rainfall or drainage.

The bye-laws also direct that the receptacle must be non-absorbent, have a bottom 3 inches above the ground adjoining, and not communicate with any drain.

With the privy-midden or pail-closet it is of great advantage to use dry earth, converting it in fact into an earth-closet.

The earth is taken from any garden or field, well-dried beside the fire, and placed in a box in the privy. With a trowel or scoop about two pounds are thrown into the privy by every person using it. This soaks up all liquid and acts as a deodoriser. Crushed peat, sawdust, and ashes are also used for this purpose. Ashes, however, do not absorb liquids.

A better arrangement is to have the two things distinct—an earth-closet and an ashpit. The earth-closet may be formed as above with a very much smaller receptacle or with a pail under the seat. As to the ashpit, the same general rules would apply as to a privy.

Pail-closets are excellent arrangements in the country. The

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[1] For the full code of these bye-laws see *Knight's Annotated Model Bye-laws of the Local Government Board*, published by Knight & Co., 90 Fleet Street, E.C., at 10*s.* 6*d.* The bye-laws by themselves can be obtained of the same firm at prices ranging from 2*d.* to 6*d.* for each series.

construction of the closet is the same as that of the ordinary privy, with an opening at the back for the removal of the pail. It is more convenient, however, in most cases, where the pail can be frequently emptied, to make simply a closet with a concreted floor sloping slightly forwards. A hinged seat with a hole in it rests on two side supports or brackets, and the tub is simply slipped in from the front (see fig. 5). There should be no "riser" or upright piece of wood in front of the pail.

Earth, ashes, peat moss, or sawdust, should be provided as mentioned above. The pails may be of galvanised iron or simply of wood. They can be easily made by sawing a paraffin

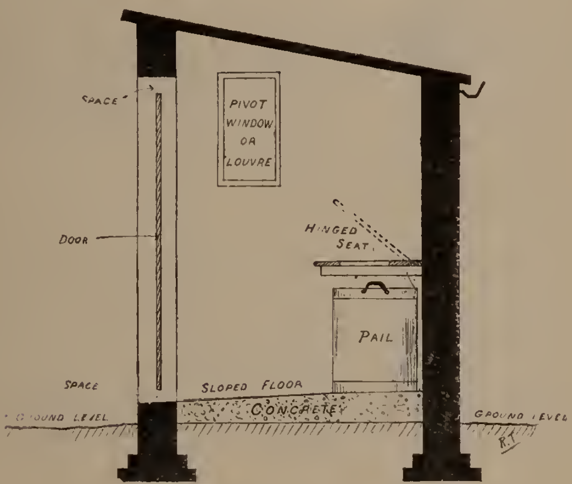

FIG. 6.—Plan of Pail-closet.

cask in two and affixing handles. When of wood they ought to be frequently tarred both externally and internally. These pails should be emptied and cleansed once a week. If they are to be taken to any distance to be emptied they should have watertight lids, so that their contents cannot be spilled. A good method of securing these lids is shown in fig. 7 on page 642, where a pail with a patent lid is shown. On the pail and on the edge of the lid are smooth wrought-iron surfaces. To the latter is fixed an india-rubber ring. On the top of the lid is a clamp, which presses the lid firmly down.

A Norfolk gentleman[1] has provided his cottagers with pail-closets, and writes as follows: "The contents are emptied into a

[1] Mr. Edwin Walker, of Field Dalling, Dereham.

hole in the ground, covered over with soil, and subsequently used for manure. The pail system is in great favour with all, the contents are less troublesome to deal with, and the closets pleasanter to use; other tenants are anxious to have them. Recently I erected a closet with a ventilating shaft built in the wall and finished off like a chimney on the outside, giving the appearance of a wash kitchen to the closet. The ventilator opening is just above the rim of the pail. This answers admirably, and I intend building all the closets on my property on this model in future." The pails used by this gentleman are made by Kirke and Foster, of Huddersfield, and are shown in fig. 7.

FIG. 7.—Pail with Kirke's patent spring lid.

Ashpits, according to the Model Bye-laws, are to be made as follows, when not in connection with the privy, and only used for dry refuse:

Every person who shall construct an ashpit, shall construct such ashpit at a distance of 6 feet at least from a dwelling-house or public building. [This is the minimum for towns.]. . . .

Of a capacity not exceeding six cubic feet, or sufficient to contain dust, rubbish, &c., during a period not exceeding one week. [This is also meant for towns. A larger ashpit would be allowed in the country.]

Of flagging, slate, or brickwork at least 9 inches thick, and rendered inside with cement or asphalted. . . .

So that the floor shall be not less than three inches above the ground adjoining, and he shall cause such floor to be properly flagged or asphalted.

It must be roofed over and ventilated, and must not communicate with any drain. It is desirable to exclude the rainfall and keep the contents as dry as possible.

On no account should slops of any kind be emptied into an ashpit. Animal and vegetable house-refuse should be burned. This can easily be done by putting it at the back of the house-fire until dry. Put into the ashpit it often causes a nuisance, and is apt during decomposition to form a forcing bed for disease-germs.

The disposal of the contents of privies, middens, closets, and ashpits is generally an easy matter in the country, where nearly every cottage has a garden close at hand. It is sufficient for purposes of health to carry the refuse to some distance from the house and bury it in the ground under a foot of soil. In village communities it would be well if the sanitary authority took charge of the removal of refuse.

(3) **A cesspool**, if constructed, should not be within 50 yards of the house, and the drain leading to it should be of glazed pipes, with a ventilating shaft at the upper end carried to a height of at least 10 feet, and not ending near a window or chimney.

A recent writer on house sanitation gives his opinion of cesspools as follows:—

"The natural outlet for animal excretions is, of course, the land; and in the country the isolated house should so dispose of them. How this should

Fig. 8.—Cesspool with open culvert.

be accomplished will depend upon the "lie" of the ground, the nature of the soil, and the kind of crops cultivated in the neighbourhood.

"Perhaps I can best illustrate my subject by a few instances. Two cases of diphtheria, one of them fatal, having occurred at a house, it was found, amongst other things, that the outflow from the kitchen sink had been conducted through the garden into a field about 20 yards off. The ground fell rapidly, and it had, no doubt, been looked upon, at the time the arrangement was made, as a simple and effective method of sewage disposal. But, though the ground was steep, it was a stiff clay, and, as no provision had been made for distributing the sewage, in time the surface of the soil became

Fig. 9.—Cesspool with disconnecting chamber.

saturated with the foul liquid, and during the dry season which preceded the outbreak of the disease, the effluvium from this open cesspool had become offensive in the extreme; and when the wind was from that quarter, it had been particularly felt in the room occupied by the little patient who succumbed. . . .

"If you must have a tank to collect and store the liquid manure, all the precautions I have named, by which house drains may be separated from common sewers, must be taken. The tank must be, if possible, a hundred yards away from the house, and a considerable part of the pot-pipe drain leading to it must be practically in the open air. This may be effected, if the ground favours, by bringing it near the surface in an open culvert for a

short distance, as shown in the diagram (fig. 8); or, if that is impracticable, by a disconnecting chamber with very free ventilation, arranged in some such manner as is shown in fig. 9. In both sketches the house is represented only by a blank wall, and in both the distance to the cesspool is shortened to get the drawings into the page.

"If there really must be one at all, the further the cesspool is away the better; and the sewage should be carried to it in pot-pipes. . . .

"Though solid excrement should, if possible, be kept out of the cesspool, and taken by some dry method direct to the land, ordinary slop-water must on no account be regarded as innocuous. On the contrary, containing, as it does, potentialities of infinite mischief, it should be got as speedily away from the premises as possible. The offensiveness complained of in the case quoted was due to sewage consisting solely of slop-water."[1]

(4) **The refuse of animals.**—The way in which the cottager's cow or pig is kept often causes a nuisance. Frequently the

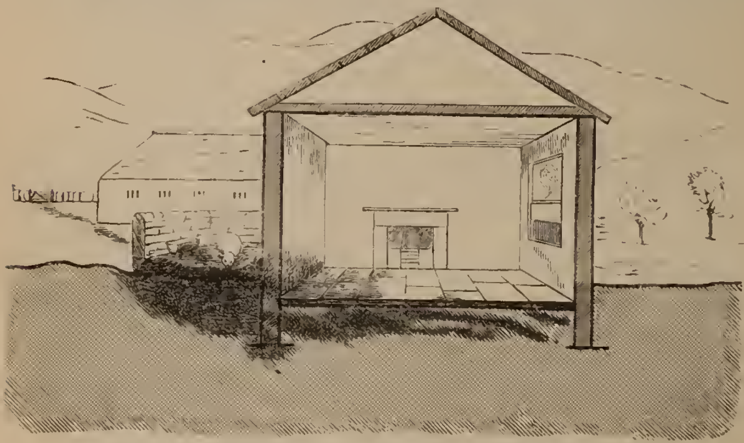

FIG. 10.—Pigsty and manure heap against wall of house.

cowhouse or pigsty is placed against the house wall with a floor simply of hardened earth, so that the liquid filth soaks through into the foundations.

These buildings ought to be at a distance from the dwelling (never less than 20 feet), and should have a floor of impervious material so laid that all liquids drain away at once into a covered, but disconnected, cesspool or directly on to the land.

A manure heap ought to be on a site constructed like that of the privy-midden if it is near the cottage, or if there is a well anywhere in the vicinity. Indeed the two middens are generally combined. But it is better to carry the manure every day to a

[1] This quotation, as well as figures 4, 8, 9, are, by the kind permission of the publisher, Mr. Richard Jackson, Leeds, reproduced from *Is my House Healthy?* a shilling handbook by Dr. J. Spottiswoode Cameron.

distance and place it where the liquids draining from it cannot be injurious.

Especial care must be taken not to allow the liquids from any of these middens, pigstys, or cowhouses to flow into a watercourse or pond, as they so often do.

III. The Water Supply.

This may be from one of four sources. Water is either (1) supplied by the authorities, being laid on in pipes, (2) is taken from surface water such as a pond, ditch, or watercourse, (3) from a well, or (4) from a rain-water cistern.

(1) "**Town water.**"—As to this source there is nothing to be said here. It is to be presumed that the sanitary authority will take care that the water is pure and the supply constant, so that there is no need for storing it.

(2) **Surface water.**—Very many cottages in the country are supplied by surface water. This may be very good, as when it comes from uncultivated grasslands or moors or rocky land; but, on the other hand, it may be, and often is, very bad, draining from land which is heavily manured or liable to contamination from neighbouring dwellings or farm buildings. For this latter form of surface water a better supply must always be substituted.

(3) **Well water** may be amongst the best or the worst of water supplies.

Shallow wells, in the subsoil, are liable to all the impurities of surface waters. The waters come actually from the same sources, and are only partly filtered by passing through a few feet of porous soil. This apparent purification perhaps only renders them more dangerous, as it produces a feeling of false security in their use.

It is a not uncommon occurrence to find such a well in the middle of a farmyard or within a few feet of some midden or cesspool, from which the liquid contents can enter at will (see fig. 11).

The same objections apply to shallow wells as to surface waters. If they are in a pastoral country and with no source of contamination in their vicinity, they may yield excellent drinking water. In other cases they should be closed and a better supply sought out.

Deep wells.—One of the safest of sources of supply for an isolated house is a deep well, especially one which draws water filtered through a good thickness of solid rock from permanent springs, but even this is liable to contamination.

As shown in fig. 12 on page 647, it is often found that the deep-well water is mixed with impurities which soak into it from the

surface around. This can be remedied by lining the interior of the well from the rock surface upwards with a coating of cement or concrete, and surrounding the mouth of the well with a small coping.

Artesian wells.—In some parts of the country artesian wells can be bored at no great cost. The water from these is at its origin free from contamination, but needs to be guarded like other wells from pollutions near the surface.

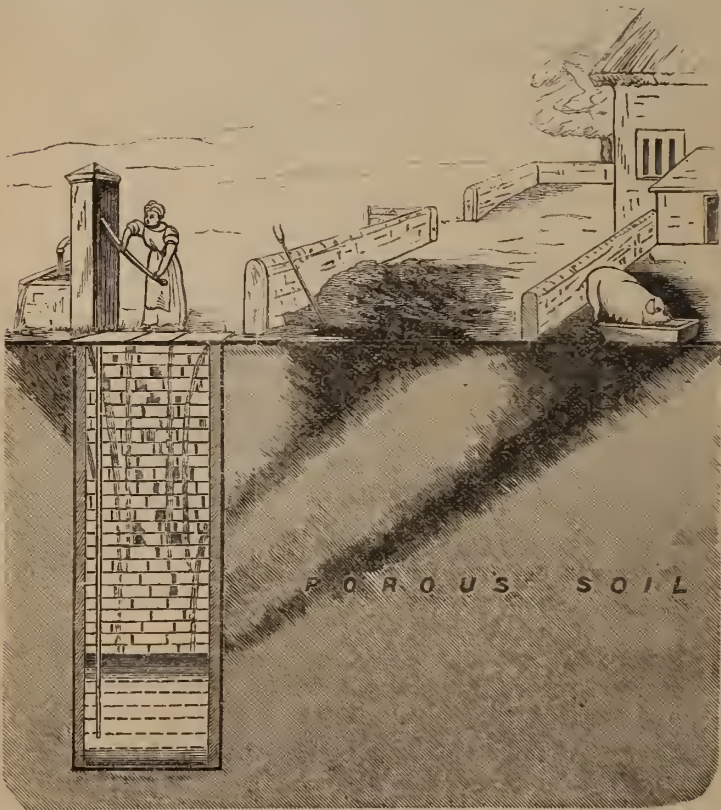

FIG. 11.—Shallow well fouled by surface water and by soakage from manure heap and pigsty.

It is often the duty of the sanitary authority to sink deep wells for cottages, and they will in some cases find it least expensive to bore an artesian well.

(4) **Rain water.**—In many parts of the country where the soil is porous and of great depth there is no good water supply available except that from rain. At a distance from towns this is of great purity. The average amount that falls on the roof of a two-

roomed cottage is upwards of 4,000 gallons a year, quite sufficient for drinking and cooking purposes for a small family. Unfortunately the methods used for collecting and storing make it in many cases both distasteful and dangerous.

The roofs of the houses are allowed to get coated with mosses, soot, bird droppings, and dead leaves; the gutters are so laid as to let the water become stagnant in them; and the cistern, which

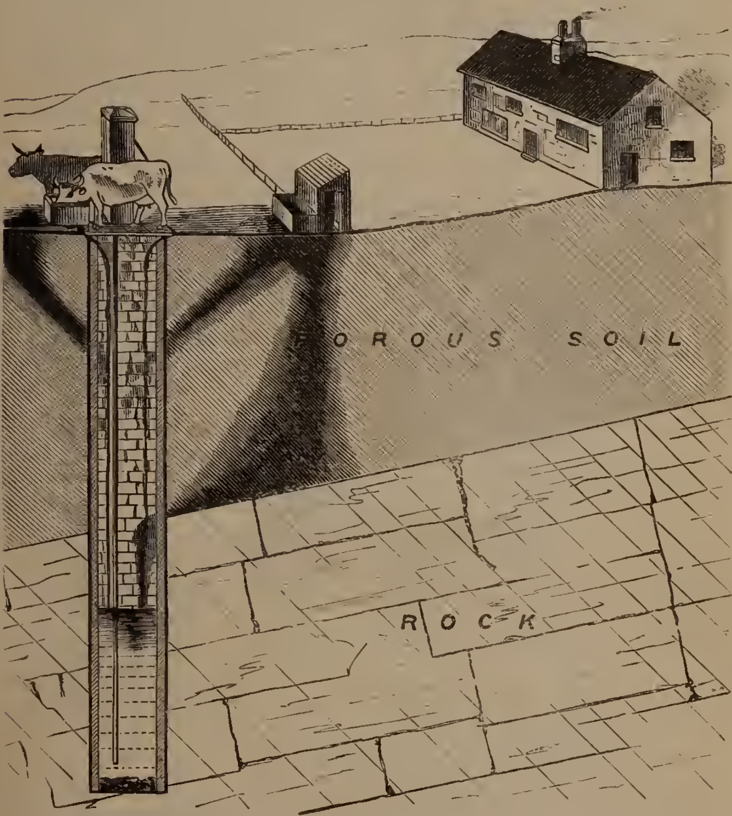

FIG. 12.—Deep well fouled by surface water and soakage into upper part of shaft.

should be of some impervious and easily cleaned material, is very generally an uncovered wooden tub of uncertain age, and coated with soot and vegetable growths.

Where rain water is collected for household purposes it should be collected from a tiled or slated roof by properly laid iron gutters. The cistern should be made of stone, slate, galvanised iron or concrete, and should have a properly fitting cover

which can be easily removed to allow of frequent cleaning. Both roof and cistern should be cleaned by brushing at least once or twice a year.

It is well to allow the water to run through a wire netting into the cistern, so as to keep back straws, dead leaves, &c. Dr. Mitchell Wilson, of Doncaster, finds a box with a perforated zinc bottom, containing sand and gravel, useful for this purpose.

Roberts's "percolator," or "rain-water separator," does this by directing the first rain that falls into the drains, by means of a vessel which tilts over when full and then allows the rain water to pass into the cistern. In this way the roof and gutters are washed before the water is collected from them.

Treatment of Impure Water.

Filters.—In nearly every case where there is any suspicion of impurity in the water it may be rendered safe by filtering and boiling. There are many filters on the market, and with reference to them all it must be remembered that *no filter is capable of acting properly without frequent cleansing* or renewal.

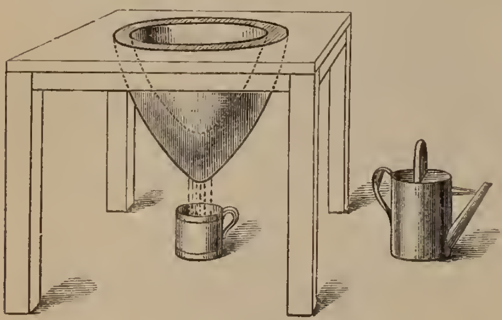

FIG. 13.—Sandstone Filter

The writer has known a filter to be used for ten years without being renewed, and it might have been in use still had not several cases of sore throat occurred in the house.

One of the cheapest and simplest filters for cottage use is composed of a block of charcoal in the bottom of a glass funnel, the water having to pass through a considerable thickness of the charcoal before issuing. The charcoal block can easily be taken out, scrubbed, and roasted in a hot oven, and is again ready for use.

Another simple filter can be made as follows:—

Take an ordinary flower-pot of 12 inches in height, and in the bottom put a layer of clean gravel, then one of finer gravel and sand, a layer of animal charcoal, and another layer of sand, each about 1½ inch in depth. The water is poured in at the top and filters out at the bottom. Such a filter should be

renewed every month, and if the charcoal is heated to redness, it is purified and can be used again.

A very simple and efficient filter can be made (fig. 13) of porous sandstone. Dr. Mitchell Wilson describes it thus, as used in his district:—

"A block of sandstone, circular in section, about a foot in diameter, and a foot and a half in depth, and slightly tapering towards the bottom, is hollowed out so as to leave a thickness of stone of $2\frac{1}{2}$ to 3 inches. This contrivance is of considerable weight, and is supported on a wooden stand. Under it a dish is placed to catch the filtered water. It can be readily cleaned by rubbing with a piece of similar sandstone or a hard brush."[1]

Boiling for ten minutes is sufficient to kill most disease germs. Boiling does not, however, always destroy poisons dissolved in water, and it is safer never to use water which has been contaminated.

IV. The Habits of the Inmates.

These are much more difficult to alter than the structure of their cottages. They are closely connected with their surroundings.

(1) **Want of washing conveniences.**—Although the English are amongst the most attentive to personal cleanliness of all the nations, there is yet often room for improvement. Washing is sometimes rendered difficult by the scantiness of water, or by the labour required in carrying it from a distance.

There is seldom any convenient arrangement for personal washing, and it is, as country doctors know, the next thing to an impossibility for a cottager to have a warm bath. The Saturday night's tub for the children is fortunately an established institution.

(2) **Overcrowding** is unfortunately frequent where houses are of limited size and the families apparently unlimited.

The following extracts from the Model Bye-laws of the Local Government Board for common lodging-houses may serve as a minimum standard:—

> In rooms of ordinary construction to be used for sleeping, where there are the usual means of ventilation by windows and chimney, about 300 cubic feet will be a proper standard of space to secure to each person; but in many rooms it will be right to appoint a larger space.

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[1] The cost of these filters is given as follows:—*Filter*—Stone, 12*s.* 6*d.*; dressing, 10*s.*; *Filter Case*—4 yards of 7″ × 1″ timber, 6*s.*; nails, &c. 1*s.*; painting, 1*s.* 6*d.*; cost of making, 3*s.*; total, 1*l.* 14*s.* The stone can be obtained from Mr. Blythman, Hisleby Quarry, Sleights, or any Cleveland Moorside Quarry.

The lodging-house keeper shall not cause or suffer any persons of the male sex above the age of ten years to use or occupy any room which may be used or occupied as a sleeping apartment by persons of the female sex.

(3) **Want of ventilation** is very common in bedrooms. Windows are frequently made so that, with the exception of a single small pane, they cannot be opened. Even where there are sashed windows, one finds that the upper sashes are nailed or fixed by neglect, so that they cannot be moved. The air in the upper part of the room can thus never be thoroughly renewed. Bedroom chimneys, especially where they are of the old-fashioned open kind, are generally blocked up with straw or paper.

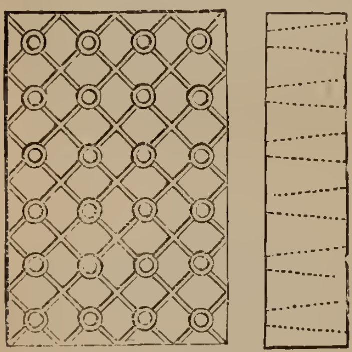

FIG. 14.—Ellison's Bricks.

A good way of ventilating such rooms is by having, in the walls under the bed and near the ceiling, one or two of Ellison's perforated bricks. These have conical perforations—the wide opening internally—so that the air entering by them creates no draught.

A simple plan is to place a 2-inch board under the lower sash of the window, quite filling up the opening, so that the air enters between the two sashes and is directed upwards. Chimneys ought always to be kept open. One of too large aperture may have a board fitted in, with a hole a foot square in the centre of it.

(4) **Storage of food.**—The proper storage of food is very little attended to. Food is kept as a rule in a cupboard in the living room, or in a damp and unwholesome cellar. Milk is especially liable to take up the germs of infectious disease. In many cases where the cottager has a cow, the milk is stored in places where it can receive emanations from middens, pig-sties, and cowhouses.

At no great expense a larder or small dairy of perforated zinc could easily be erected on the shady side of the house. A dairy should be floored with concrete, or stones set in cement, and should have stone shelves, so that it can be easily kept perfectly clean and sweet.

(5) **The Swill-tub.**—In our English cottages there is far too much food wasted. Fragments of meat, bread, and vegetables, which the Scotch, and especially the French, housewife would prize as capital ingredients for the broth pot, are thrown

away as useless. Nor is the common mode of disposal of them a healthy one. The fragments are generally thrown upon the kitchen midden or ashpit, or into a swill-tub for the use of the pig. The swill-tub is often kept in a corner of the kitchen, is rarely washed out, and forms a fruitful soil for the growth of various putrefactive and disease germs. The tub should be kept in the open air, away from the house, and should be well washed from time to time. A galvanised iron pail is easier to keep clean than a wooden bucket.

Conclusion.

It may be pointed out with reference to almost all the foregoing sanitary defects, that they not only tell against the health of the individual, but are violations of the law of the land. The remedies can be enforced by the Sanitary Authorities. But at a time like the present the arm of the law is not long enough, nor are its processes speedy enough, for our purpose; and it is necessary that every one should help if a good result is to be attained in the short time at our disposal.

Hector McLean Wilson.

FIELD EXPERIMENTS ON THE FIXATION OF FREE NITROGEN.

The four plots, the experiments upon which are the subject of this paper, belong to a series of plots that were marked off upon my land at Eynsham Hall, near Witney, Oxfordshire, in the year 1887, for the purpose of agricultural experiment. The plan formulated was not of a very definite character, except in one particular, which was that I had resolved to make a varied use of the then new phosphatic manure, Basic Slag; as far as phosphoric acid was concerned, basic slag was to be the only form in which it was to be used on the plots. In the year 1886 I had used it in large dressings on farm land, and with notable success. A great deal of the work which I proposed to do, and have since done, was for my own particular instruction on several points bearing on the rotation of crops, on tillages, on close and wide drilling, on thick and thin seeding, on the action of subsoils when mixed with surface soils, and other allied problems. I may add that the experiments have fully answered my purpose.

I was singularly unfortunate in the choice of the land, and have given myself unnecessary trouble by making use of an area very difficult to work. The land was conveniently near to my house, and it once formed part of a wood covered with oak trees, from which oak and hazel underwood had been grubbed and the land roughly grassed. I had merely the satisfaction of knowing that it had never been cultivated, had never received any manure, and was exceedingly poor—which was a virtue in this case. The soil, to a depth varying from ten to twenty inches, was a clay loam with very little organic matter in it, and rested on pure Oxford Clay. It was very well drained. The land contained the seeds of wild plants which continually came into growth; and it yearly gives in places a good crop of bluebell. Even when cultivated it grew very poor grass crops, but, as I shall show, it would grow fair crops of red clover.

The four plots which are specially under consideration are, like all the other plots, each of ten yards long by ten yards wide, and are separated from each other by grass paths three feet wide. These four plots were marked for "No Manure," that is, they were intended to be carried on with tillages only, no kind of manure to be used. At the time I instituted the plots I had no very fixed idea as regards the cropping I intended to follow; generally, it was to embrace a series of experimental rotations.

The four plots were, as nearly as possible, very much alike in colour and texture, and to a depth of twenty inches the soil was reddish, showing the iron to be in the state of peroxide. The subsoil was a pure clay, of dirty greenish-white colour, with streaks of red.

I should have done much better had I profited by the experience of Rothamsted, and chosen old farm land which had been agriculturally exhausted by continuous cropping without manure. Anyone undertaking in this country experiments in agriculture turns naturally to our great school at Rothamsted, and to the papers published by its eminent investigators Sir John Lawes and Dr. Gilbert. With Rothamsted I am well acquainted, and have carefully studied all the memoirs that have emanated therefrom since its establishment as an experimental station. In a certain sense it is somewhat disheartening for an intending experimenter to study these papers, with their carefully drawn tables showing an amount of labour, skill, and perseverance that few men could hope to rival. However, my ambitions were not in the same direction, and, as I said before, my object was of a more private and restricted character. What has struck me as so immensely meritorious in the Rothamsted work is the minuteness of the records and their evident trustworthi-

ness. Any one at all acquainted with this kind of work can appreciate the enormous value of these labours, the fruits of which will descend to a remote posterity, and will ever stand as classic models of all similar experimental work.

To return to the plots. In order to reduce the fertility of these four plots, which in my scheme are numbered 21, 22, 23, and 24, the surface soil to a depth of about three inches, with its vegetable growth, was removed by paring. The surfaces were forked over rather deeply in January, 1888, and left to weather. In the following April, No. 23 was planted with barley, No. 24 with oats, and No. 22 with Italian rye grass. Abundance of seed was used, and the drills were pretty close together (seven inches), as it was expected the crops would be small; the weeding was all done by hand. The remaining plot No. 21, was sown with broad red clover.

The results were very poor crops. The barley gave, grain and straw together, $10\frac{1}{2}$ cwt. per acre. The oat crop gave 9 cwt. per acre. The grain of the barley and oat crops was not threshed out, but it would probably not have been more than 10 bushels per acre. The Italian rye grass gave of green grass, in two cuttings, 41 cwt., which, dried into hay, would have been about 10 cwt.

These crops will of course be regarded as exceedingly small, and they point clearly to the fact that the land had little or no "condition" so far as white corn-growing was concerned; in short, that its available (or nitric) nitrogen was at the very lowest ebb. I consider that this point is better demonstrated by the yields of these three gramineous crops than could have been done by an elaborate analysis in the chemical laboratory. This experiment proved, so far as Nos. 22, 23, and 24 were concerned, nothing as to the mineral constituents of the soil. These might have been present in superabundance, and yet have produced the same or very similar results in the absence of assimilable nitrogen.

We now come to the broad red clover crop, on No. 21. The treatment of the land was the same as for the three other plots. The seed was sown in April, 1888. The crop was harvested on August 30, and made into hay, the yield of which was at the rate of 18 cwt. per acre. This was not a normal crop, but, as a plant of more than annual duration, it was likely to give a better result. The second year, unfortunately, it was by mistake top-dressed with a mixture of basic slag and kainit, and gave at two cuttings a yield of $9\frac{1}{4}$ tons of green clover, equal to more than two tons of hay per acre. This top-dressing, of course, threw it completely out of the running. So far, therefore, this experiment affords us no means of knowing what available mineral plant-food the

soil of this plot contained. It must be borne in mind that, as I will afterwards explain, I had not then in view the question of the fixation of free nitrogen.

We now stand thus as regards these plots. It is proved tolerably clearly that they have no "condition" available for the growth of cereals, and, in fact, that they must be remarkably deficient in "nitric" nitrogen. Yet, I shall afterwards show that, without the addition of nitrogen in any form whatever, two of the plots produced four crops containing a notable quantity of nitrogen.

The Italian rye grass plot, No. 22, was left untouched after harvesting, and it threw up an abundant crop of wild plants, including eight gorse plants, some briars, numerous grasses, two clovers, wild strawberries, bluebells, dandelions, and a number of others. In this state it remains.

The two plots of greatest interest are the barley and the oats. These plots, for the next crop, were each dressed with 20 cwt. per acre of basic slag, and forked and trenched eight inches deep, thereby exposing the subsoil, which in its turn was treated with basic slag at the rate of 20 cwt. per acre. In the one case the subsoil was merely loosened and moved by the fork, without being turned over. In the other case the subsoil was completely turned over eight inches deep, so that the basic slag must have then permeated the whole depth of 16 inches. It will be seen afterwards that the results of the next cropping were better in this case than in the former, where the subsoil was not turned over.

We have now, in the autumn of 1888, two plots on a clay loam, prepared with a full dressing of basic slag, supplying abundance of phosphoric acid, lime, and magnesia. In this state they were left to weather during the winter, and until March 1 of the following year. On a clay loam, whatever may have been its previous percentage of available potash, it is very probable that the disintegrating influence of the weather would produce more than sufficient of this plant-food.

On March 1, 1889, spring beans were dibbled on the two plots, Nos. 23 and 24, in rows eighteen inches apart and nine inches between the seed. The plants throve well, save some that were destroyed by wire-worm. The growth on both plots was vigorous, and the plants were very handsome, showing a marked contrast to the previous mean-looking cereal crops. A few field-peas that were accidentally mixed with the beans also grew with great luxuriance.

The crop on No. 23 was harvested between September 7 and 19, and yielded, per acre, 37 bushels of grain, and $22\frac{3}{4}$ cwt.

of straw. On No. 24 the produce was, per acre, 55 bushels of grain and 24 cwt. of straw.

Whether the superiority of crop on No. 24, as compared with that on No. 23, was owing to the loss of some plants on the latter by wireworm, or whether it was owing to the more perfect mixing and turning over of the soil and subsoil in No. 24, I am unable to say. Taken together, they gave a general average crop of 46 bushels of grain and over 23 cwt. of straw per acre, and this without the addition of any nitrogenous or organic manure whatever, but with a full complement of ash constituents.

At this stage it is necessary to explain that when I planted the beans I was not doing it with a view to the special study of the problem of the fixation of free nitrogen. The first very clear ideas I acquired on this subject came in conversation with my friend Dr. Gilbert. It is quite true that nitrogen was "in the air," so to speak, short notices of the experiments of Hellriegel and Willfarth, Berthelot, Schloesing, and others having attracted attention, so that it was felt by many besides myself that, as regards agriculture, the nitrogen question was *the* question.

The bean experiment, which, made under the circumstances I have described, was very striking, did not, however, prove anything as to the source of the nitrogen. Orthodoxy suggested the explanation that the nitrogen was derived from the soil and the subsoil, and that to the bean plant belonged a power of assimilating soil nitrogen not possessed by the cereals. But, in view of the conclusions established by Hellriegel and Willfarth, there could be no difficulty in understanding where the nitrogen of the bean crop came from.

From this period onward I looked at the experiment on the two plots, Nos. 23 and 24, as bearing directly on the nitrogen-fixation question, and in that sense continued it. With a view to accumulate in the soil an increased quantity of nitrogenous residue I seeded both plots, on March 3, 1890, with a mixture of the following leguminous plants: cowgrass, white clover, alsike, yellow trefoil, and a little lucerne. Mown on August 18, the crop gave 1 ton 8 cwt. of hay per acre.

The next year (1891), with two cuttings, it gave a mean produce of nearly 3 tons per acre, no manure of any kind having been applied.

In the autumn of 1891 the clover and bean ley of the two plots, Nos. 23 and 24, was trenched to sixteen inches, and thrown up in ridges to undergo weathering action during the winter. I had thus accumulated in the soil the root-residues of the bean and clover crops, and, in addition, the supposed accumulated

nitrogen in the soil itself resulting from the leguminous growth. I had then to consider what nitrogen-consuming crop I would make use of, that should be capable of utilising the accumulated stock of nitrogen then in the soil. I should have preferred a cereal, either barley or oats, but I had been so much pestered with wireworms, mice, and small birds, that I determined in spite of the natural heaviness of the soil to make use of the potato plant. The soil had, however, been made very friable by exposure during a hard winter. On March 15, 1892, Magnum Bonum tubers were planted in rows; they appeared above ground on April 10, and were duly hoed, and finally moulded up. The haulm was very healthy, dark in colour, but not remarkably luxuriant. I did not anticipate a very good crop; nevertheless, on October 10, they were raised and weighed. The plot, No. 23, yielded at the rate of 7 tons 11 cwt. per acre; and the plot, No. 24, at the rate of 8 tons 7 cwt. per acre. The average, as nearly as possible, is 8 tons per acre. This is about 2 tons above the average of the kingdom, and, for the soil, I considered it good.

The cropping of plots 23 and 24 is here shown at one view:—

Plot	1888	1889	1890–91	1892	1893
23	Barley	Beans	Clovers	Potatoes	Wheat
24	Oats	Beans	Clovers	Potatoes	Wheat

To resume and sum up the results. On a soil shown to be very low in "condition," so far as regards the production of cereals and other gramineous plants (consumers of nitric nitrogen), and the proportion of ash constituents in the soil being unknown, after a very liberal manuring with phosphoric acid, lime, and magnesia, and taking it for granted that under the circumstances there would be an abundant supply of potash and other plant food resulting from disintegration, also with a complete winter tillage of the best kind, we have grown a strong crop of beans, followed by a fair crop of clover hay, and this without the application of any nitrogenous or organic manure.

The quantity of nitrogen collected in the bean crop may have been about 152 lb. per acre. In the two clover crops the quantity of nitrogen may have been 224 lb. per acre. The quantity remaining in the soil, in the form of roots, and accumulated in the soil itself as the result of the leguminous growth, would be an essentially important item from a manurial point of view. The nitrogen from these two sources would necessarily be almost the only nitrogen that could be supplied to the nitrogen-consuming potato crop. As was ascertained at the

commencement of the tentative experiment with the cereals, the amount of available nitrogen in the soil must have been exceedingly small.

We have thus, from beginning to end, collected a quantity of nitrogen in the three crops, beans, clover, and clover, equal to 376 lb. per acre, or equivalent to more than one ton of nitrate of soda per acre, over a period of three years. This is equal to 750. lb. of nitrate of soda per acre per annum. In addition, the amount of nitrogen contained in 8 tons of potatoes per acre, and acquired from the underground accumulation of nitrogen, may be assumed to be 59 lb. Of course, it is not by this experiment scientifically proved that the nitrogen was derived from the atmosphere, as all soils contain a very large quantity of inert nitrogen in some form or other.

On the other hand, these experiments certainly go to show that the leguminous plants, beans and clover, thrive well on their own account in a soil very deficient in nitric nitrogen, but well supplied with mineral food, and that they are capable of accumulating nitrogen in the soil itself, and by their roots capable of supporting an after-crop requiring so large a supply of nitrogen as potatoes.

In continuance of the experiment I have, in the autumn of 1892, sown on plots, Nos. 23 and 24, Rivett wheat, without any additional manure of any kind, in order that I may ascertain if there is a still further quantity of assimilable nitrogen derived from the previous bean and clover crops and not utilised by the potatoes. From my actual results this year on farm land running in similar grooves, I am inclined to think there will be enough for a moderate crop.

I take this opportunity of saying that I have now in hand some 450 acres of arable land which is being gradually brought under a systematic rotation, beginning with a two-years leguminous crop, followed by two years of nitrogen-consuming crops. So far the results correspond very well with expectations; but two or three seasons must elapse before a clear balance-sheet and sound matter for discussion can be worked out in a profitable form. The 435 lb. of nitrogen per acre, carried from a soil in three kinds of crops, which soil had only shown a capacity for producing minimum crops of barley and oats, containing on an average, grain and straw together, only 12 lb. of nitrogen, is a very notable fact, whatever may be its practical value; and, had it not been for the new light as to the sources of the nitrogen of papilionaceous crops, would have thrown us back upon subsoil nitrogen, and upon ammonia or nitric acid from the atmosphere, to account for its accumulation. JAMES MASON.

WILD BIRDS USEFUL AND INJURIOUS.

I. Hawks, Owls, Thrushes, and Chats.

The recent paper [1] by Earl Cathcart, in the Journal, has drawn attention to the necessity and practical importance of a wide-spread knowledge of birds and their modes of life on the part of farmers and others interested in the cultivation of the land. The pleasure derived from observing birds and becoming familiar with their plumage, their notes, and above all, their habits, is never-ending; and if children were encouraged to take an intelligent interest in birds and other forms of wild life, many of them would, in after years, find the monotony of their outdoor work immensely relieved by sights and sounds, meaningless to and unheeded by the vast majority of people, but very pleasant to those who can appreciate their significance. Moreover, the quickness of observation, so much developed by the study of nature, cannot fail to be of great service to its possessors. But the argument in favour of acquiring ornithological knowledge which, I am afraid, has the greatest weight with most agriculturists, is the intimate relation between birds, and pounds, shillings, and pence. This is only natural, and it is perhaps too much to expect everyone to care for birds for their own sake, naturalists being to a great extent born and not made, though early training has undoubtedly a very considerable influence in fostering a love of nature and her manifold productions.

Birds affect both sides of the farmer's balance-sheet to an almost incalculable extent. Unfortunately, the means by which they reduce the profits of cultivation are only too apparent, whilst the good services rendered by them, both on the farm and in the garden, are in many cases only discernible by those who have studied their ways very thoroughly, and who have besides a fair knowledge of insect pests, and their boundless power for evil. A description of the ravages of these small but most powerful enemies, and some estimates of the damage they do, will be found in Miss Ormerod's excellent work on *Injurious Insects*, to which the reader is referred for information on all points connected with their life history, together with the best methods for preventing their attacks. Suffice it here to say that the damage caused by one species alone may be reasonably estimated at a sum so large that it conveys no definite meaning to ordinary mortals. Though many causes, some of them unknown, influence the prevalence or

[1] "Wild Birds in Relation to Agriculture." By Earl Cathcart (Journal R. A. S. E., vol. iii., part ii., 3rd series, 1892, pp. 325–38).

scarcity of insect attacks, it cannot be doubted that birds are one of the most important agencies in keeping them within bounds. But though birds are in this way such invaluable allies, ignorance of their habits and appearance is the rule, even amongst those whose mode of life brings them into constant contact with them.

If, however, there is little real knowledge, there is plenty of prejudice; and many beautiful and useful birds are sacrificed, because the wildest notions are prevalent as to the nature of their food and behaviour. Notable amongst the destroyers are gamekeepers, who ruthlessly kill many of the most interesting and beneficial species, including even such birds as the green woodpecker, which feeds largely on grubs destructive to timber, and the dusk-loving nightjar, whose whole life is employed in doing good; not to mention owls and kestrels, whose services have recently obtained recognition in connection with the notorious plague of voles in Scotland. Gardeners also destroy many useful birds, including the tits, which are incessantly searching for and devouring numberless insects. It is curious that both gardeners and gamekeepers, though they have such excellent opportunities of studying the ways of birds, seldom take the trouble to watch them closely, or even to open the bodies of their victims for confirmation of their surmises as to the nature of their food. Amongst both classes of men there are, of course, many honourable exceptions, but the rule holds good, nevertheless, and the majority are content to adopt the almost superstitious beliefs of their predecessors. Bird-catchers are largely responsible for the diminution of several species, though their evil practices have been considerably checked by the Wild Birds' Protection Act. The objectionable and semi-barbarous fashion of adorning hats and wearing apparel with feathers has caused the destruction of countless numbers of birds. Those who encourage this custom are indirectly guilty of cruelty, and it is difficult to refrain from giving utterance to certain obvious and most unpleasant deductions. The cruelty cannot be denied, as witness the following statement by Mr. Howard Saunders with regard to the butchery of kittiwakes for the sake of their plumage: "In many cases the wings were torn off the wounded birds before they were dead, the mangled victims being tossed back into the water; and we have seen hundreds of young birds dead, or dying of starvation in the nests, through want of their parents' care." This is only one instance, but similar ones might be multiplied, sufficient perhaps to make even a slave of fashion feel uncomfortable.

In the case of our rarest birds another agency is at work,

that special abomination the "Collector," who by means of his paid satellites is instrumental in exterminating many most interesting species. Idle curiosity is also much to blame; whenever a "fancy" bird appears out of its own district, be it a bittern, short-eared owl, green woodpecker or kingfisher, some one is sure to be inspired with a mania for destroying it, after which the poor bird is either thrown on the muck-heap, or, being stuffed and made into a ghastly caricature of itself, becomes an offence for the rest of its existence. These are some of the chief causes of the destruction of our birds. Ignorance is at the bottom of much of this wanton slaughter, and it is to be hoped that the spread of ornithological knowledge will bring about a better state of affairs. For the present let us be thankful that it is not a national custom to eat tomtits and nightingales.

The present paper is an attempt to describe briefly the salient points in the life history of some of the species most intimately connected with the practice of agriculture and gardening. With regard to their food, in particular, the information given is very imperfect; but it has been collected from very many sources—from the works of the best authorities, from many farmers and others who live in the open air, and, in not a few instances, from my own observation. It is hoped, therefore, that a fairly correct idea of the usual and occasional food of the various birds may be gathered from the following pages.

It would be unwise to attempt to show the proportion in which the components of their food are consumed, because individuals of the same species vary much according to opportunity and their own particular fancy. For this reason it would require records extending over several years, and including observations on an enormous number of birds from different localities, to enable us to draw any definite conclusions as to the proportionate amount of good and harm with which each species should be credited. In all probability this will never be done until we have a qualified ornithologist, appointed by some competent authority, to devote his whole time to the study of this important and most interesting question.

It must, however, be borne in mind that, in nearly all cases, the misdeeds of birds are much more manifest than the benefits which they confer upon us. For instance, anyone can see and estimate the damage done to a bed of strawberries by blackbirds; but it is not such a simple matter to calculate the amount of harm prevented by their destruction of slugs and other garden pests. Again, birds are frequently accused of causing mischief of which they are entirely innocent; for they are often unjustly credited with destroying a crop, when they

are actually feeding on the very insects to which the loss of the plant is really due. Sometimes they have to bear the blame for the failure of a crop which should rightly be attributed to an unsatisfactory seed-bed. The bite of a slug, too, is not infrequently mistaken for that of a bird, though a small amount of observation will show to which the injury is due, the work of a bird exhibiting sharply cut edges, while that of the mollusc has a rounded appearance.

No attempt has been made in these pages to conceal the mischief committed by birds. On the contrary, the harm of which they are guilty has perhaps been given undue prominence from the very fact above alluded to, that it is so much more readily observed. Though it is a hard task to chronicle the misdeeds of one's favourites, a conscientious attempt has been made to give an impartial, and, it is hoped, fairly correct summary of the most important points in their life history.

Hawks.

Of the many species of hawks which were formerly plentiful in this country, only two can now be considered at all common. Times are much changed since numbers of kites, or gleads, were to be seen on London Bridge feeding on the garbage of the streets and river; since the peregrine was honoured by special protective legislation; since the harriers frequented our waste lands; even since the buzzard was a common accompaniment to the mountainous or sylvan landscape. In the present day the kestrel and the sparrow-hawk are the only representatives of their family existing in most localities; and it is a matter of wonder that they have survived the constant and bitter warfare carried on by pheasant-preservers, and others, against all birds with hooked beak and curved talons.

The **Kestrel** (*Falco tinnunculus*) renders itself conspicuous by hanging almost motionless in the air, its long tail and pointed wings clearly defined against the sky; and its beautiful flight never loses its charm for those who delight in observing the habits of birds. Windhover, hover-hawk, stannel, cres-hawk, and red hawk are amongst the names by which this little falcon is locally known. Its whole length is from thirteen to fifteen inches. In young birds and females the plumage of the upper parts is rufous, barred with black, and the tail is barred throughout its length. The male in adult dress has the back pale chestnut with a few black spots, and the head and tail bluish-grey, the latter with one broad black band near its extremity. The kestrel (fig. 1) is found throughout the British

Islands, but migrates from the northern portions in winter. Its handsomely mottled brownish-red eggs, four to six in number, are usually laid either on a convenient ledge or recess in cliffs, or in the old nests of other birds, particularly those of the carrion crow.

It is one of the most useful birds we have; and if the

FIG. 1.—Kestrel, *Falco tinnunculus*. FIG. 2.—Sparrow-hawk, *Accipiter nisus*.

beauty of its flight and plumage cannot save it, the benefits which it confers on farmers ought to gain for it efficient protection from molestation, notwithstanding the occasional havoc it undoubtedly commits amongst very young game. By far the greater portion of its food consists of mice and beetles, and the number of mischievous creatures thus destroyed is enormous.

An abundance of kestrels and other mouse-eating birds would therefore act as a most efficient check on the vole plague in Scotland, or in any other locality unfortunate enough to suffer from a similar visitation. One of these red-hawks was recently captured in a granary, to which, apparently, it must have gained access by means of the cat-hole in the door, and the object of its visit may be readily conjectured. The kestrel has been seen in the act of hawking cockchafers on the wing, and I have seen one apparently catching flies in the air; but it takes most of its food from the ground, snatching it up without pausing for a moment in its flight. Any animal of sufficiently small size is borne away; moles, young rats, weasels, small birds, lizards, frogs, and perhaps even snakes, all at times form part of its diet. It appears that it frequently hunts about on the ground for its food, for worms, grasshoppers, and the larvæ of beetles have been found in the crops of individuals which have been opened; and Canon Tristram mentions one that contained 178 wireworms, perhaps gathered from a newly ploughed field. It is not often seen feeding in this manner, but the nature of its food proves that it not unfrequently does so. One to my knowledge was killed with its feet covered with cow-dung, which had doubtless adhered to it during its search after beetles.

Like all the birds of prey and many insectivorous species, the kestrel returns the indigestible portion of its food through the mouth in the form of pellets, or, as they are usually called, "castings." These castings indisputably prove the nature of the bird's prey, and usually consist of the fur and bones of mice, together with the shining wing-cases of beetles.

The kestrel is, as a rule, mercilessly shot and trapped by game-preservers, partly from the fact of its being confounded with the sparrow-hawk, from which it may be readily distinguished by its red-brown colouring, pointed wings, and characteristic flight; but chiefly because, under certain circumstances, it really does serious mischief to young game, and, though much less frequently, to tiny chickens in the poultry-yard. When there is a family of clamorous young hawks, in the possession of fine healthy appetites, on the ledge of rock or in the crow's nest at the top of the Scotch fir, when beetles are scarce and mice wary, the keeper's array of coops, each with its brood of fluffy little helpless pheasants, must appear a veritable god-send to the parent kestrels. Having once discovered such an easy prey, and ignorant of the heinousness of their crime, it is only natural that they should continue to carry them to their hungry nestlings, till the keeper's gun puts an end to their

depredations. I have this year known sad havoc caused by these beautiful birds. Nearly fifty young pheasants have been carried away from the same place, and three, four, or possibly a larger number of kestrels have been concerned in the robbery. It is quite evident, therefore, that if they once take to visiting the coops they must be summarily disposed of, but under no other circumstances should they be destroyed.

Three facts about the kestrels should always be borne in mind. The first is that they very frequently bring up their young within easy reach of hand-reared game without taking a single chick, but, notwithstanding the temptation, continue to lead a life of harmless utility. Secondly, it is only during a very brief period of the game-birds' existence that any danger need be apprehended from the windhover, for it will not touch them except during their helpless infancy. Thirdly, throughout the rest of the year the kestrel does incalculable and unmixed good, by the destruction of hosts of field-mice and injurious beetles. The value of farm produce thus saved from destruction is almost beyond estimation. It is, therefore, a short-sighted policy to exterminate such beautiful and useful birds because they do a certain amount of harm, that harm being confined to a very few weeks in the year.

The **Sparrow-hawk**, Pigeon-hawk, or Blue hawk (*Accipiter nisus*), is a much more mischievous and less useful bird than the kestrel. In full plumage the male, which measures about twelve inches in length, has the upper surface of a dark bluish-slate colour, and the under parts rufous with darker bars. The female, which is three inches longer than the male, is dark brown above, greyish-white, barred with brown, beneath. The young may be known by the rust-coloured margins of the feathers of the upper parts.

This short-winged hawk (fig. 2, p. 662) usually builds its own nest, but sometimes takes possession of the former abode of a crow or magpie, a larch or other fir-tree being the site most frequently selected. The eggs, four to six in number, are bluish-white, handsomely marked with rich reddish-brown; but they vary considerably in appearance, some being almost or quite unspotted.

When in search of food it glides rapidly but stealthily along woodsides and hedges, and, snatching its quarry from the ground or on the wing, carries it away to some quiet spot, where it strips and devours it at leisure. It frequently eats only a very small portion of its prey. A heap of feathers marks the spot where it has dined; and in most cases it will be noticed that the hawk has made use of some tiny mound, or perhaps a

stone, on which to pluck its victim. When not engaged in the pursuit of its prey its movements are different. It crosses the country by giving a few strokes of its wings, and then gliding through the air for several yards with the impetus thus acquired. This manner of flight is characteristic, and is sufficient to identify the bird at a considerable distance. Sometimes also it indulges in a stately circling flight, not unlike that of the kestrel.

The favourite food of the male appears to be the blackbird, though small birds of any kind are readily taken. The hen is much stronger and flies at larger quarry, such as wood-pigeons, jays, partridges, young pheasants, and teal. The sparrow-hawk is a most dangerous foe both to game and poultry; and the legs of the many victims, in and around a nest which has contained its young, tell only too plainly of the havoc which it has committed. In addition to the food already mentioned, mice, young rabbits, weasels, and large insects are also known to form part of its diet.

A certain amount of good must therefore be placed to the credit of the sparrow-hawk. It devours many injurious insects, and one has been seen on the grass catching the destructive crane-flies or daddy-longlegs. It destroys wood-pigeons and many other mischievous species, and is one of the most efficient means of keeping the numbers of small birds within bounds. Moreover, its presence has a most beneficial effect on the crowds of unwelcome visitors which frequent the ripening corn.

There is no great difficulty in destroying a brood of these hawks, if it is thought necessary to do so. An occupied nest is generally betrayed by small fragments of down from the parent bird adhering to the branches of the tree in which it is placed; and the young, when fledged, are very noisy, their wailing cries for food frequently leading to their discovery.

The **Peregrine Falcon** (*Falco peregrinus*), one of the handsomest and most high-spirited of its race, is now so rare that only a few lines need be devoted to it. It must not, however, be passed over in silence, because it is—or would be if not so persecuted—a valuable ally of the farmer in keeping down the numbers of wood-pigeons. It kills and eats quantities of these voracious birds; and Professor Newton states that, in a locality where partridges and stock-doves were both plentiful, one of these powerful hawks habitually took the pigeons instead of the game birds, notwithstanding the more rapid flight of the former.

Other items in its bill of fare are grouse, blackgame, pheasants, wild-ducks, teal, landrails, moorhens, gulls, guille-

mots, lapwings, snipe, cuckoos, kestrels, hares, rabbits, and doubtless any other bird or beast that it can conquer.

The **Buzzard** (*Buteo vulgaris*), another large hawk, is very different in its habits from the fearless and dashing peregrine. Indolent and harmless though it is, no mercy is shown to it by gamekeepers and loafers; it is a hawk, a big hawk, and therefore it must be slaughtered. It is very pleasant to watch one of these grand birds sailing slowly and majestically on motionless wings in wide and graceful circles. Its presence, too, has a practical as well as a picturesque aspect; for its appearance effectually drives the ring-doves from the corn, and many mice and rats are destroyed by it. The harm which it does to game is very slight, and the destruction of a few rabbits and leverets can scarcely be considered a sin. Its food consists chiefly of mice, rats, moles, snakes, frogs, lizards, earthworms, beetles, grasshoppers, and even carrion; for I had a fine bird which lost its life through taking an unfortunate fancy to the paunch of a rabbit with which a vermin trap had been baited.

I recently saw one, a wanderer on the fells, sitting lazily on a crag within a short distance of me, and it was sad to think that we might still have them nesting commonly with us, were it not for the senseless persecution which has been indiscriminately meted out to all hawks alike.

The **Merlin** (*Falco æsalon*) is the only other hawk still remaining to us in sufficient numbers to justify its inclusion in the present paper. The adult male is only about ten inches in length; the plumage of the back is blue-grey, and the breast rufous, with darker brown markings. The young birds and females have the upper parts dark brown, and the under surface brownish-white, with dark brown patches. The female is about twelve inches in length. This beautiful little falcon may be distinguished from the kestrel by the absence of chestnut colouring; and from the sparrow-hawk by the long and sharply pointed wings.

A few pairs still nest amongst the heather of our moorlands, but, unfortunately, more and more rarely every year, owing to the persecution which they suffer at the hands of gamekeepers. The harm which the merlin does to game is, however, infinitesimally small, its food whilst it remains on the fells consisting almost entirely of wheatears, yellow-hammers, pipits, and other small moorland birds, and of larks, dunlins, and similar wading birds when it is obtaining its sustenance on the seashore. It is a very bold and dashing little hawk, and its rapid evolutions on the wing confer a wild charm on the heather-clad fell, or on the desolate saltings of the coast.

Unfortunately, even when the owners of moors, on which these small falcons breed, allow them to rear their young in safety, they cannot complete the good work of protection; for merlins leave their breeding-grounds in the autumn, and I know of some tall poplars close to a salt-marsh where two or three wandering birds are killed nearly every year, their poor little bodies being strung up on barbed wire fencing as though they were dangerous marauders.

The chapter on "Vermin" in the excellent volumes on Shooting, forming part of the "Badminton Library," should be studied by every game-preserver. This work is written for sportsmen by sportsmen, and is free from any suspicion of undue bias in favour of the birds.

Owls.

When the red-backed kestrel retires to roost, the good work of destroying mice is carried on by the owls, which come forth at dusk from barn and ivied tree to prey upon those tiny but most destructive marauders. Our ancestors were wise enough to leave entrances to their barns for the owls' especial convenience; because they recognised the benefits accruing from the presence of birds which manifest such deep interest in the home life of rats and mice, and whose beautifully adapted eyes and noiseless wings enable them so efficiently to follow up their particular hobby.

Owls, like hawks, return the indigestible portion of their food through the mouth, and quantities of their castings may be found in places which they frequent. An examination of these pellets should be quite sufficient to convince any reasonable being not only of the harmlessness of owls, but also of the incalculable service which they render to agriculture and, in a less degree, to the preservation of game. Yet in many localities these poor birds are relentlessly persecuted by game-keepers and loafers, and even by the farmers themselves, who, above all others, ought to do their utmost to protect their feathered benefactors. Few sights fill the lover of nature with a greater feeling of pity, mingled with disgust, than the skin of an unfortunate owl, stuffed and distorted into the shape of a hand-screen, and adorned perhaps with eyes of a colour the appropriateness of which is apparent only to the lively fancy of the taxidermist.

Amongst the instruments of destruction used by keepers, probably the most objectionable is the pole-trap. This consists of a small circular steel-trap fastened, unbaited, on the top of a

stout stake driven perpendicularly into the ground; advantage being taken of the fact that many birds are fond of alighting on such a position. Very few really mischievous birds are captured by this device, but on the other hand many of the most harmless and interesting species fall victims to it; one pole-trap alone having, to my knowledge, in a short space of time, caused the mutilation and death of two owls, two night-jars, and a squirrel. Of the intense cruelty of these and all steel traps it is perhaps futile to speak, because they appear to be a necessary evil until someone is ingenious enough to devise an equally simple and efficacious, but less barbarous, means of keeping down the numbers of rats and rabbits.

The **Barn-owl**, White-owl, or Screech-owl (*Aluco flammeus*), may be recognised (fig. 3) by its white breast and buff-coloured upper parts, beautifully flecked with grey. Its whole length is about fourteen inches. It shows a particular predilection for barns and other buildings, in which it frequently rears its young, choosing some convenient nook for the purpose, though it also nests in hollow trees and other situations. In its time of nesting and in the production of its eggs it is somewhat erratic, for young birds have been found at nearly all seasons, and the nestlings of the same brood often vary considerably in size, showing that the eggs were laid at irregular intervals.

Though it is not till dusk that the barn-owl usually comes forth to procure food for itself or its young ones, I have frequently seen it hunting during daylight, even in brilliant sunshine; a habit well known to those who are familiar with this interesting species. It subsists mainly on mice and shrews, including the destructive little vole or, as it is more commonly called, the short-tailed field-mouse. It is interesting to watch the old birds bringing food to their nestlings; the outline of their prey can be clearly seen against the evening sky, and the frequency with which they visit their young is very suggestive of the numbers of mice destroyed. The quantity of these small devastating animals thus consumed is indeed enormous; and, even if the barn-owl were mischievous in other ways—which it is not,—its very great services in keeping down an enemy, capable of such wholesale destruction, should cause it to be rigidly protected throughout the year.

Its diet is frequently varied with rats, moles, and water-rats, whilst bats, large insects, and even fish are also sought for, and no doubt give pleasing variety to the bill of fare. Small birds are occasionally taken, but not often; thus, in the examination of 706 pellets, Dr. Altum found the remains of nineteen sparrows, one greenfinch, and two swifts. I recently found the

feathers of an adult starling lying on the floor of an out-house amongst a quantity of castings; the unfortunate bird had probably fluttered in to roost, just as the owl was waking up, and so had been promptly pounced upon and put out of the way. It is interesting to watch a barn-owl enter a building by means of the narrow loopholes in the wall; it throws up its

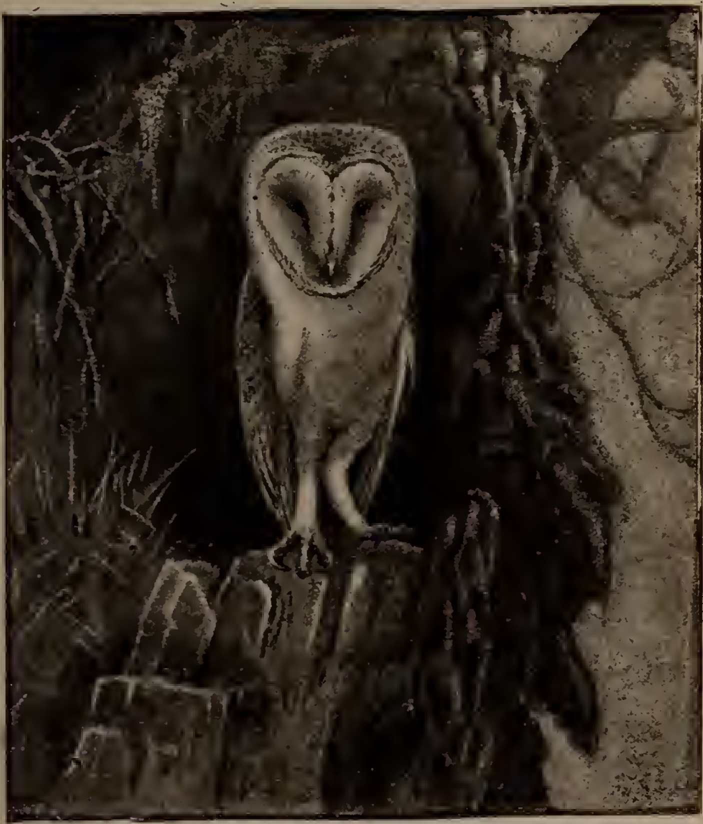

FIG. 3.—Barn Owl, *Aluco flammeus.*

wings above its back, almost assuming the position of a butterfly at rest, and darts through the straitened entrance, without pausing a moment in its flight.

Its habits bear the strictest investigation; in fact, the more closely it is studied, the more is its harmless and useful character made manifest. The accusation that it destroys the eggs and young of pigeons is quite without foundation. Such loss is in

almost all cases due, not to owls, but to four-footed vermin; and if rats are effectually excluded from the dove-cote, the marauding promptly comes to an end. This fact was long ago pointed out by Charles Waterton, the celebrated Yorkshire naturalist. He was a devoted admirer of the barn-owl, and, from his intimate knowledge of its habits, was a most able and competent advocate, well qualified to speak authoritatively on the great services which it renders to mankind.

It is usually stated that the barn-owl does not hoot, but there is reason to believe that it does so, at least occasionally; and this is my own impression, though I have no conclusive proof of the fact.

The young birds make most interesting pets. Their self-importance is quite phenomenal, and their manners and customs are grotesque and comical to a degree. They have a habit of bending their heads down to the level of their perch, solemnly wagging them to and fro, of snapping their bills, of putting out their tongues—not in the usual vulgar manner, but sideways—and of hissing like a half-opened ginger-beer bottle; their inflated throats, closed eyes, and elevated beaks unmistakably proving the intense devotion with which they apply themselves to this imposing ceremony. The spectators are evidently intended to be deeply impressed; and the owls feel quite hurt if the proceedings are interrupted and the effect marred by a gentle chuck under the chin. Two young birds, now in my possession (one of which is shown in fig. 3), are very tame, taking their food readily from the hand. The capacity of their throat is somewhat surprising; not only do they swallow small trout whole, but a chaffinch, feathers and all, was disposed of in the same manner; the latter, however, necessitating many vigorous gulps before it was satisfactorily stowed away.

The **Tawny owl** (*Strix aluco*), or, as it is frequently called, the Brown owl, Wood-owl, or Hoot-owl (fig. 4), lives principally in the woods, usually bringing up its young in the hollow of a large tree. Its plumage, both above and beneath, is beautifully mottled with various shades of grey and brown, and it is therefore very different in appearance from the white-breasted barn-owl, to which, however, it bears a strong resemblance in its useful and blameless character. The male is about fifteen inches in length, and the female is somewhat longer.

A very large portion of its food consists of rats and mice, and it ranks with the barn-owl and kestrel as one of the farmer's best friends. Water-rats, moles, and young rabbits frequently form part of its diet, and more rarely leverets, squirrels, small

birds, and fish; whilst beetles, including the destructive cock-chafer, are sometimes devoured by it in great numbers.

The wood-owl seldom ventures abroad during the day, for it appears to be greatly inconvenienced by the light of the sun. If it is disturbed from its retreat before dusk, it is amusing to

FIG. 4.—Tawny Owl, *Strix aluco.*

see the small birds of the neighbourhood collect to jeer at and mob it. Its best-known cry is the familiar hoot, "Tu-whit! to-who!" a merry note, and very pleasant to hear in the waning light of a still evening. It is an extraordinary instance of superstitious folly that the cry of this fascinating bird has been, and perhaps still is, considered the foreshadowing of evil, filling

the minds of the ignorant with wild presentiments and a murderous desire to silence the author of the dreadful warning.

I have known a wood-owl's nest in a hollow beech tree for several years, and have freqnently inspected it. On one occasion in May I went to see the owlets, and, after trying to obtain a good view of the nest, I looked up, and suddenly became aware of a little fluffy sprite, within a few feet of my face. It was framed by the fresh green beech leaves, and gazed at me with an intensely solemn and inquiring expression in its large liquid eyes. I caught it, whereupon it snapped its bill loudly, and one of the old birds came and expostulated, notwithstanding which, I took it home for a little while. It was most self-possessed and did not look at all frightened, but, on the contrary, ate pieces of rat with much apparent satisfaction. Its dignity was, however, somewhat marred by the unfortunate circumstance of its being being rather top-heavy.

With regard to the accusation that the brown owl habitually destroys game-birds, a small amount of reflection makes the practical impossibility of such a proceeding manifest, for the simple reason that young pheasants and partridges are safely hidden beneath their mother's wing long before the tawny owl considers it fit to stir abroad. Even the most uncompromising preserver could hardly consider its fancy for the young of ground-game a very great sin, whilst this taste is in itself an additional claim upon the sympathies of the agricultural world. It is possible that both the wood-owl and the barn-owl may occasionally take winged game, but such behaviour is certainly most exceptional.

The **Long-eared owl** (*Asio otus*) and the **Short-eared owl** (*Asio accipitrinus*) deserve a passing notice. Both species are about fourteen inches in length and are adorned with tufts of feathers, usually called "horns" or "ears," though they have nothing whatever to do with the true ear. The distinctive names of the two species are derived from the relative length of these ornamental appendages, which are respectively an inch and a half, and three quarters of an inch long.

Both are beautiful birds and very useful, for they feed chiefly on rats and mice. On no account, therefore, should they be destroyed, either from a mistaken idea of their habits, or for the gratification of idle curiosity. The destruction of "fancy" birds, more particularly in the breeding season, is a most unfortunate custom, and cannot be too strongly deprecated.

The long-eared owl is particularly fond of clumps of evergreen firs, and in most wooded districts is not a very uncommon species. It rears its young in the former abode of other birds,

or takes possession of the deserted drey of a squirrel. It appears to be more partial to game than the other species of owls, and is even said to alight on the coops at night for the purpose of devouring the young pheasants, which it frightens from their shelter by flapping its wings and snapping its beak.

The short-eared owl comes in autumn to this country from the north of Europe, often in very large numbers. Many remain with us through the winter, frequenting moorlands and open country rather than wooded districts. A few scattered pairs remain to breed, "the mistaken zeal of gamekeepers, however, in destroying this and other species of owls, which are probably the best friends the preserver of game could possess, precludes the chance of such nests remaining unmolested, unless placed in the most unfrequented spots." It does not appear to be troubled by sunlight, and frequently hunts during the daytime.

The Thrush Family.

The **Blackbird**, or Merle (*Turdus merula*). This familiar and handsome species, like so many others noticed in the present paper, is both beneficial and detrimental to the cultivation of garden or field produce. It is, in many instances, quite impossible to lay down with certainty how far the damage to fruit or to farm crops, resulting from the presence of a particular kind of bird, is counterbalanced by the benefits it confers upon the gardener or agriculturist by the destruction of injurious insects and the seeds of obnoxious weeds. Very many circumstances have to be taken into consideration before it can be satisfactorily decided whether an individual species is, in the aggregate, useful or the reverse. We must consider its relative abundance, the conditions of the locality in which it occurs, the system of cultivation followed, the kind of crops grown, the nature of the season, the time of year, even the individual fancy of the birds themselves; for it is known that different birds of the same species will sometimes, under the same conditions and with the same opportunities, bring up their young on very dissimilar diet. Our knowledge is, at present, far too fragmentary to enable us to assign definite characters to all our birds. But it is well to remember that though we can usually form a fairly full estimate of the damage they effect, we have only the vaguest idea of the loss which would be sustained from insect ravages if it were not for their services.

The nest of the blackbird is familiar to every egg-hunting boy. It may be distinguished from that of the thrush by the fact of its having the interior lined with fine grass. The eggs are pale blue, variably mottled with reddish-brown. The nest is

usually placed in evergreen bushes, ivy, or hedges; but, as with most species, considerable variation in the choice of the site and in the colour of the eggs is not uncommonly displayed. One nest, for instance, I found absolutely on the ground, concealed by coarse herbage. In the same neighbourhood I discovered a pretty clutch of eggs of a delicate blue colour and quite devoid of any markings whatever. An egg from another nest has all the markings clustered together at the smaller end.

The great crime of which blackbirds are guilty is the malappropriation of strawberries, currants, raspberries, apples, plums, and other fruit. The quantity of these delicacies which they consume entails a serious loss, particularly when their depredations are carried on in market-gardens. If unmolested, they will in many cases devour the entire crop. It is, unfortunately, almost impossible to keep them from the fruit with any degree of efficiency without destroying them; for they exhibit considerable cunning in finding their way under netting, and soon learn to disregard any method of scaring which they find by experience may be braved with impunity. Amongst the many ingenious devices adopted for keeping birds at a respectful distance may be mentioned the amusing expedient of attaching a cat, by means of a ring and swivel, to a long cord fastened securely at each end, so that it can walk up and down the length of its tether; a method which is said to be very effective in protecting the fruit. Tame hawks have also been employed in a similar manner, and have proved themselves efficient bird-scarers.

Blackbirds must certainly be kept from the ripening fruit if a good crop is to be obtained. Before putting them to death, however, it is only fair to remember that their ravages are of necessity confined to a limited period, while for the rest of the year they live blamelessly and destroy quantities of snails, slugs, beetles, and other insects, including many injurious caterpillars. They do not care for snails in summer; a fact which may be readily demonstrated by depositing a number of the molluscs in question on a lawn frequented by the birds. They also feed largely on earthworms, and their habit of hunting for their prey on the well-kept grass plots close to houses has rendered them universally familiar. Another considerable portion of their food consists of wild fruits—for instance, yew-berries; and I have seen them with their intestines stained purple by the colouring matter from the berries of the dog-wood. Scattered grain from farm-yards, and small seeds, also contribute to their nourishment; and they are grateful for bread-crumbs and other scraps when the weather is severe.

The blackbird's beautiful mellow song, leisurely uttered, is in itself no slight recompense for the loss of strawberries and currants.

The **Song-thrush**, Throstle, or Mavis (*Turdus musicus*) is in many respects similar in its habits to the blackbird. It is not, however, such an inveterate robber of fruit, and it appears to destroy a greater quantity of snails. Its habit of breaking the shells of these objectionable pests, and also those of marine molluscs, on some convenient stone has often been observed. These sacrificial altars may be found surrounded by a quantity of broken shells; showing that the same stone is frequently resorted to when it has once given satisfaction. The food of the throstle otherwise resembles that of the blackbird, consisting chiefly of worms, insects, fruit, and wild berries; and I have seen one pecking at a small fir-cone, doubtless with the object of obtaining the seeds. In vine countries it feasts royally on ripe grapes.

Its nest may be recognised at a glance by the carefully rounded cup-shaped lining of mud, on which are deposited the rich blue eggs, almost invariably spotted with black. Occasionally the markings are brown, and, in some rare instances, are altogether absent. The nest is usually constructed in a hedge or bush, but sometimes in a stone wall or other less conventional situation. I have found two nests on the ground, one sheltered by a tussock of coarse grass, the other amongst a luxuriant growth of strongly smelling ramps or garlic.

The throstle is a beautiful songster, and its voice exhibits great power, quality of tone, and variety. Its notes readily suggest articulate speech; and the discomfited traveller, hurrying along the country road at his very best pace to catch a train, may hear it say very plainly: "Go it!—Go it!—Stick to it!" then with great and increasing conviction, "You'll do it!—You'll do it!—You'll do it!"

The Song-thrush is to a great extent a migrant; and this fact accounts for its persistent presence in gardens when the fruit is ripe. Even after large numbers have been killed, fresh arrivals take the place of the slaughtered birds. The same applies to the blackbird, though it is not perhaps so essentially a migrant as the throstle. Both species are very fond of frequenting turnip fields in the autumn, and are met with in large numbers by sportsmen in pursuit of partridges. Under these circumstances their abrupt and sudden rising is productive of considerable flurry in nervous or inexperienced marksmen.

The **Mistletoe-thrush**, or Missel-thrush (*Turdus viscivorus*), is the largest of the common British members of the family. It has

acquired several local names: for instance, that of storm-cock from its habit of singing in wild weather, even in snow; screech-thrush, from its grating call-note; and holm-thrush, doubtless from its fondness for the berries of the holm or holly. Its plumage above is nearly uniform clove-brown, the under parts being white, tinged with yellow, and boldly spotted with black; so that it bears considerable resemblance to the song-thrush, from which, however, its greater size is sufficient to distinguish it. In the young bird the plumage of the upper parts is prettily variegated with rich buff. The nest is usually conspicuous, and resembles that of the blackbird, but is larger and more clumsy. The eggs are bluish or reddish-white, with purplish-red markings.

This fine thrush has rendered itself unpopular in some districts by exhibiting too great a partiality for fruit. Its food, however, consists largely of wild cherries, and the berries of the yew, hawthorn, holly, service-tree, mountain-ash, juniper, and ivy; whilst its fondness for the berries of the mistletoe has gained for it the name by which it is generally known. Like the other members of its family, it renders good service by devouring slugs and the destructive larvæ of beetles and moths. Earthworms also form a considerable portion of its sustenance.

The missel-thrush is an example of those species whose distribution has become much more general within comparatively recent times. Though now well known throughout the kingdom, there is good evidence to prove that a century ago it was either absent or very rare in many districts, particularly towards the north. In the breeding-season it is bold and pugnacious, driving away intruders of greatly superior size with exemplary intrepidity.

The **Fieldfare** (*Turdus pilaris*) usually arrives in this country towards the end of October, though sometimes in the previous month. It comes from its breeding-grounds in the north of Europe in large flocks, and (fig. 5) is one of the best known of our winter visitors. Its plumage is handsome, and the ash-grey of the rump and upper tail-coverts shows up conspicuously in flight against the dark-coloured tail—a feature by which it may be readily identified on the wing. Its call-note is also characteristic, and, though by no means musical, sounds pleasantly enough when the frost has driven the woodcocks to the unfrozen ground around the springs, and the hardy white-breasted dipper sings merrily from a boulder in the icy stream. With the return of spring the fieldfare leaves us and journeys northwards to rear its young amongst the spruce firs of Scandinavia and other parts of the Continent.

In its habits and food it closely resembles the missel-thrush; but, as it does not remain here while the fruit is ripening, its behaviour is entirely beneficial in its effect. In addition to wild berries of various kinds, it consumes quantities of slugs and insects, which it principally obtains from pastures and meadow-

FIG. 5.—Fieldfare, *Turdus pilaris*.[1]

land. In very hard weather it has been known to do some damage to turnips in its endeavour to ward off starvation.

The **Redwing** (*Turdus iliacus*) is another common winter visitant, arriving in flocks before the end of October, and returning northwards in the spring. It is rather smaller than the song-thrush, from which it may be distinguished by the broad whitish streak above the eyes and by the bright rufous colour of the sides and under wing-coverts, from which feature it derives its common name.

Its food in this country chiefly consists of worms, snails, slugs and insects; and it does not take to eating berries so readily as the other thrushes. Both redwings and fieldfares suffer terribly in severe winters, and large numbers perish from starvation. The comparative lengths of the five members of this family are approximately, missel-thrush eleven inches, fieldfare and blackbird ten inches, throstle and redwing nine inches.

[1] Figs. 5–10 are from Yarrell's *British Birds* (Gurney and Jackson).

The Flycatcher.

The **Spotted Flycatcher** (*Muscicapa grisola*) is a summer visitor, arriving in May from its winter quarters in Africa. It is about five and a half inches in length, and its plumage (fig. 6) is greyish-brown above, the lower parts being dull white with a few darker markings. The young are beautifully mottled with buff, and present a very different appearance from that of their parents. Notwithstanding its sober dress, it soon makes its presence known by its conspicuous habit of taking up a position on the top of some post, or other convenient station, whence it darts into the air to capture a passing insect, frequently returning to

Fig. 6.—Spotted Flycatcher, *Muscicapa grisola*.

the same place to continue its watch. As in the case of other insectivorous birds, the "snick" of its bill when it snaps up its prey is distinctly audible. Amongst its many local names are those of beam-bird, bee-bird, rafter-bird, post-bird, wall-bird, cherry-chopper, cherry-sucker, and cobweb-bird. The nest, a very pretty and compact structure, is commonly placed in standard or trained fruit trees, in ivy, trellis-work, or holes in buildings, and on beams in outhouses. There are, however, few places in which the spotted flycatcher will not occasionally rear its young, its ideas on this point being decidedly original. The eggs are usually very pale blue in ground colour, profusely spotted with reddish-brown; but I once found a nest, built in the side of a hay-stack, containing five eggs of a delicate blue colour, with the reddish markings almost imper-

ceptible. Another unusual occurrence was brought to my notice not long ago. All the eggs were taken from a flycatcher's nest in an orchard, yet about a fortnight later the bird was found sitting on a second clutch of eggs in the same nest. The flycatcher has been described as a silent bird, but its harsh note "tzee-chuck" is rather obtrusive than otherwise, and the young are clamorous when being fed.

As its name implies, it feeds almost entirely on flies, gnats, and other winged insects, which it dexterously snaps up in the air. That few species of insects come amiss to it, may be inferred from the fact that it will catch large moths, such as the yellow-underwing, and it may also be seen endeavouring to capture white butterflies on the wing. It sometimes enters houses, attracted no doubt by the flies on the window-panes. It is said to take berries in autumn, and has been accused of eating cherries and raspberries. Dissection, however, has proved that the attraction is not the fruit itself, but the living creatures which are to be found upon it.

The services of the spotted flycatcher in destroying swarms of insects, many of which either plague ourselves or injure our crops, are not marred by any mischievous propensities. The birds should therefore be encouraged, and their nests and eggs carefully protected.

The Robin and Hedge-sparrow.

The **Robin**, Redbreast, or Ruddock (*Erithacus rubecela*) is the most familiar and favoured of all our birds. Its confiding disposition, sprightly appearance, and sweet song, aided by the almost superstitious sentiment with which it is regarded, have procured for it an unwonted freedom from persecution. Its nest is placed in any convenient nook, such as the corner of an outhouse, an old tin can, or a hole in a bank or tree. Some very odd situations have from time to time been selected. A very singular instance is that of a pair of robins, which reared their young in a pigeon-hole bookshelf in a schoolroom, notwithstanding the daily presence of seventy children. The nest is often conspicuous, owing to the abundance of dead leaves used in its construction; but at times it is exceedingly carefully hidden. The robin becomes almost domesticated if its comforts are attended to; and will closely approach anyone digging in the garden, for the sake of the worms turned up by the spade. In addition to its confiding nature and brisk appearance, it possesses two less attractive traits, for it must be admitted that it is very pugnacious and extremely greedy.

Its food consists principally of earthworms, slugs, spiders, woodlice, beetles, moths, and butterflies; also of seeds and wild berries, those of the deadly nightshade for instance, and to some extent of fruit. In winter it frequents the neighbourhood of houses, and becomes practically omnivorous. It possesses a good appetite and great capacity; for it is stated that one robin will devour fourteen feet of earthworms during the day. Though earthworms render valuable service in the fields, yet, as Mr. T. Wood has pointed out, they are by no means so desirable in a garden; for when present in great abundance they do considerable damage to seedling plants by upsetting them

FIG. 7.—Hedge-sparrow, *Accentor modularis.*

and by loosening the soil around their roots. I recently watched a very tame young robin, with two small orange-red patches on the breast showing through the spotted plumage of infancy, busily hunting for food under raspberry and gooseberry bushes. It captured a quantity of insects, taking them from the ground, or flying up to the bushes above its head. Amongst others, it caught a fairly large moth, but did not succeed in disposing of it satisfactorily. It did not pay the least attention to the fruit, though it was hanging temptingly within easy reach.

The **Hedge-sparrow**, Dunnock, Creepydyke, Hempie, Daddy Isaac, or Shufflewing (*Accentor modularis*), in many of its structural and other characteristics closely resembles the robin. Its

food is similar, consisting of worms, seeds of grass or other plants, insects in their various stages, and, in hard weather, of bread-crumbs and scraps from houses. It has no connection whatever with the rough and obtrusive house-sparrow, beyond bearing the same name. This unfortunate circumstance, however, together with the similarity of their plumage, has been quite sufficient to confound the two species; and many an inoffensive dunnock has lost its life during indiscriminate sparrow-warfare. The comparatively slender bill of the hedge-sparrow (fig. 7) differs so markedly from the strong, conical mandibles of the house-sparrow, and their actions are so unlike, that a very slight amount of observation is sufficient for the discrimination of the two species. The hedge-sparrow has a very characteristic habit of flirting the wings and tail, which will always lead to its identification.

Its beautiful blue eggs are well known, and may frequently be found as early as the first fortnight of March, long before the opening buds have expanded sufficiently to form a safe protection from rain and prying eyes. Their pretty cradle is composed of roots, green moss, and wool, with a neat lining of hair.

The hedge-sparrow "is unobtrusive and harmless, of an amiable disposition, and deserves protection and support."

Chats.

The **Wheatear**, or Fallow-chat (*Saxicola œnanthe*), is one of the earliest of our summer visitors, coming to this country about the middle of March, and occasionally even in the previous month. It frequents open ground, and soon attracts attention by its sprightly actions and boldly-marked plumage. It may be readily recognised by (fig. 8) the white rump and pied tail, which are very conspicuous as the bird flits rapidly about. It is about six and a half inches in length. The nest is usually built in a rabbit-hole, or in some crevice under a huge stone. Another favourite situation is under a clod of earth, but the increase of more thorough tillage has greatly reduced the number of such sites. The pale blue eggs are usually unspotted, but occasionally speckled with rusty dots. Wheatears are considered a great delicacy, and enormous quantities have been trapped for the table. The number taken in former days is almost incredible; and it is stated that, a century ago, a shepherd caught eighty-four dozens in one day.

The food of this species consists of slugs, worms, spiders, small beetles, and other insects, taken both from the ground and on the wing.

The **Whinchat** (*Saxicola rubetra*) is a summer visitor, arriving towards the end of April. It is fond of open heaths, but also exhibits great partiality for meadow land, and, one is tempted to add, for telegraph wires. The male (fig. 9) is a pretty bird, having a fawn-coloured breast, pied tail, and a well-defined white streak above the eye. The female and young are much paler in colour. The nest, carefully concealed, is placed on the

Fig. 8.—Wheatear, *Saxicola œnanthe.*

ground, and contains bluish-green eggs, faintly speckled with reddish-brown. The call-note of the whinchat, incessantly uttered when its young are approached, resembles the word "u-tick," and furnishes a name by which the species is known in some districts.

Its food consists of worms, small slugs, beetles, and other insects, particularly wireworms, and it is said to take berries occasionally.

The **Stonechat** (*Saxicola rubicola*), unlike its congeners, remains with us in considerable numbers throughout the winter.

Fig. 9.—Whinchat, *Saxicola rubetra.*

It is most frequently found on furze-covered heaths, and does not often occur on cultivated land. The male (fig. 10) is one of the handsomest of our small birds; its black head, white collar,

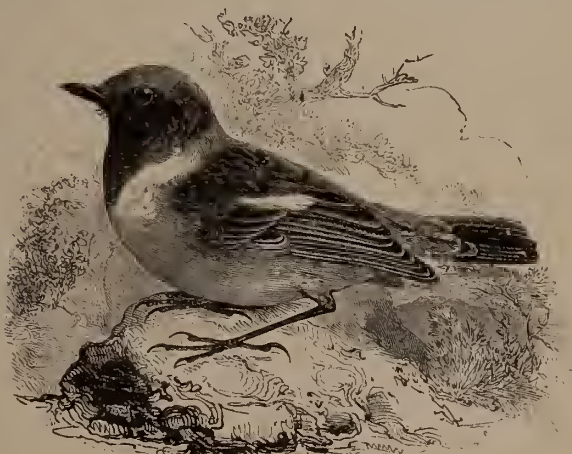

Fig. 10.—Stonechat, *Saxicola rubicola.*

and rich bay breast presenting a most pleasing appearance. The female and young are more uniformly coloured, and are much less attractive.

In this species the tail is uniformly dark brown and not

pied, as in the whinchat. The nest, neatly made and well concealed, is placed on the ground; and the eggs are pale blue, with a variable amount of reddish-brown markings. When the nest is too closely approached, the old birds become very fussy and clamorous, continually repeating their note, "hweet, jur, jur," and exert themselves to lure the intruder away from their treasure. They are exceedingly lively little birds, restlessly flitting from bush to bush, and usually alighting on the topmost spray.

Their food consists of worms, slugs, beetles, small moths, and butterflies, often captured on the wing, and of a few small seeds.

CHARLES F. ARCHIBALD.

UTILISATION OF STRAW AS FOOD FOR STOCK.

THE great deficiency in the hay crop of 1892 has again brought under consideration the question of the more general utilisation of straw for stock-feeding purposes, whereby it may, when requisite, be made a complete substitute for hay by being chaffed and intermixed with richer ingredients, whilst in other cases the consumption of hay may be greatly economised by the more extensive employment of straw chaff in the general dietary. Many practical agriculturists have distinguished themselves by pointing out from their own experience the best methods by which these aims may be accomplished, and not a few have strictly advocated the principle that in general farm management there ought to be a much larger consumption of straw as food for stock than is commonly the case, as this seems the most feasible and economical way of increasing the capabilities of farms to sustain larger stocks of cattle and sheep in winter.

There can be no doubt that from the earliest times straw has been employed to some extent as food for stock, but there have been bad as well as good ways of doing this, and our forefathers did not always choose the right method. Arthur Young condemned the practice in his day of dairy cows, when out of profit in winter, being fed on nothing else but straw fodder. He says in his *Calendar*:—

"The common cases of straw feeding are of cows, young cattle, or black cattle just brought in, and not yet put to fatting. With regard to cows the food is certainly insufficient, and lets them down so much in flesh that when

they calve and are expected to yield productively they lose a considerable time, and that perhaps the most valuable, in getting again into flesh before they give their usual quantity of milk; but if they have been well and sufficiently wintered they are half summered and yield at once adequately. For young cattle it is still less management, for their growth is stunted and they never recover it."

The strawyard feeding of dairy cows and young cattle has ever since been commonly practised, and this enlightened teaching of Arthur Young is, to some extent, still necessary to be enforced, though all intelligent farm occupiers who have studied the question give regularly to their animals, when feeding in strawyards, oilcake, or some other auxiliary food of a richer nature, in small quantities, just sufficient to keep them in proper condition. Part of the benefit is derived from the manure being rendered of much greater value.

Throughout the last half-century straw has extensively been utilised in cattle-feeding, especially by the best farmers, whose aim has been to keep well and remuneratively in winter the largest stocks of cattle and sheep the fodder of the farm could sustain with a reasonable addition of auxiliary foods. The late Dr. Voelcker once affirmed that "it is undoubtedly a fact that some practical feeders are in possession of the secret of converting considerable quantities of straw into beef." The late Mr. John Coleman in 1877 stated that there were cases within his knowledge in which the largest part of the straw grown on farms was passed through the bodies of animals, and he was himself at that very period superintending management of this nature on Lord Wenlock's home farm at Escrick, Yorks. The farm was in extent 220 acres of arable and 430 of pasture. More than 100 head of cattle and 400 sheep were kept by the aid of the chaff-cutter and pulper, and with the addition of artificial food. Mr. Coleman (in this Journal, Vol. XIII., 2nd series, 1877) said: "I am quite certain that, by the proper use of chopped straw and pulped roots, from one-third to one-fourth more cattle can be kept upon a given area of land."

The admixture of root pulp with straw chaff here adverted to by Mr. Coleman has at times been very much practised to economise roots when these are scarce after years of partial turnip failure. The root pulp and chaff after being well intermixed are allowed to remain in heaps for some time before being used, forty-eight hours not being considered too long, so that the considerable fermentation induced might cause a softening and partial cooking of the straw, thereby rendering it far more digestible. In winter dairying those who do not provide silage find it most economical to utilise mangel-wurzel by

pulping the roots and intermixing the pulp in this way with straw chaff.

This leads naturally to some reference being made to the method employed by the late Mr. Samuel Jonas, described in the Journal (Vol. VII., 2nd series, 1871, page 85), of carrying out on a large scale in a systematic way this intermixing of straw chaff with green chaff from clover, grass, vetches, trifolium, or any other green crop convenient to be chaffed and intermixed with straw chaff. The regular practice of Mr. Jonas for many years, which was afterwards pursued by his son, Mr. F. M. Jonas, was that of attaching a big chaff-cutter to his threshing-machine whenever threshing took place, the straw passing immediately from the thresher into the chaff-cutter. At the same time another smaller chaff-cutter was set in motion to cut up green chaff derived from any crop at the time on the farm fit for utilisation. The chaff was then carried away to be stored in some large barn or other storehouse, and trodden down in alternate layers of green chaff and straw chaff, salt being abundantly strewn thereon during the process. The green chaff would only be about 1 cwt. to the ton in proportion to the straw chaff, just sufficient to cause a very salutary and effective fermentation, and the food would remain sometimes a great many weeks, and even months, before being required to be used. The chief objection against this seems to be that threshing is carried on to a great extent in winter and early spring when there are no green crops to be thus utilised; but Mr. F. M. Jonas in carrying out his father's practice found that it answered just as well to mix root pulp with the chaff, and when he threshed in winter he was accustomed to do this, making the storage in every respect the same except the substitution of root pulp for green chaff.

In fact, Mr. F. M. Jonas had in 1877 entirely abandoned green chaff, and substituted mangel-wurzel pulp instead. In a letter published in the Journal (Vol. XIII., 2nd series, 1877), he said:—

"On this farm, which consists of 850 acres of arable land, I cut into chaff every year 100 acres or more of wheat or oat straw just as described in the Journal; but I use pulped mangel instead of tares, rye, &c., as I can depend better on the quantity of moisture contained in it. . . . By using a large quantity of chaff for sheep, and folding all my roots on the land, I can now keep one and a half sheep per acre, whereas a few years since, when scarcely any straw chaff was given to sheep, and roots were carted off to bullocks, one sheep per acre was enough."

Mr. Jonas also mentioned various devices he had successfully carried out for cheapening the chaffiug process. This had been

done by putting the chaff-box close up to the barn works and by sinking a long elevator to the chaff-box, so that the chaff is delivered direct into the store place instead of having to be conveyed thither by hand.

Mr. G. T. Wright, Stokes Farm, Wokingham, in the same volume of the Journal, said he had tried the system several times and found it very useful. He adds:—

"It seems to me the great secret in preparing it is to have it well trodden down into the store place, then it comes out with a smell like new hay, and is much relished by stock."

Another method of improving straw chaff for feeding purposes, and of making it much more digestible as well as palatable, is that of steaming it. Nor is this costly on large farms having a fixed steam-engine at the homestead, as the waste steam from the engine can usually be conveyed to some chamber or receptacle for chaff. This is very systematically done at the Royal Warwickshire Prize Farm homestead of Mr. H. E. Thornley, Radford Hall, Leamington, and indeed has been found of high utility on numerous large farms, the steaming process being calculated to purify and render perfectly sweet and wholesome hay which has been spoiled in making; even the worst, although absolutely white with "must," has been known after being chaffed and steamed to be readily devoured by all kinds of stock. Straw chaff is invested with a peculiar and grateful aroma after undergoing the process, but the chief benefit imparted is that of making it much more digestible.

Another method, extensively resorted to sometimes, of making straw chaff more available for stock-feeding has been that of throwing over it soups consisting sometimes of treacle or sugar dissolved in boiling water; but the favourite soup for the purpose employed by the late Mr. Charles Randell, of Chadbury, was linseed boiled in water and afterwards thickened into a gruel by the addition of barley meal or maize meal.

Mr. T. E. Dowden, the occupier of a large farm in Dorset, once wrote me as follows:—

"I have been accustomed for the past thirty years to cut a large quantity of my straw into chaff and throw over it a gruel composed of boiled linseed, ground Indian corn, or any other meal I can buy cheap. I have found horses, cattle, and sheep do well on it. I think it very desirable to make less hay, and to summer feed instead, as haymaking is a very expensive process."

Here we have a large farmer adopting this methed of utilising straw solely that he might not be compelled to make so much hay in the usual course of things. Certainly, then, there is every probability that it might be resorted to with profit under

the pressure of circumstances arising from the partial failure of the hay crop. When the fact is also recalled to memory that the late Mr. Charles Randell was accustomed at times to feed large flocks of sheep throughout winter entirely on straw chaff made to absorb this kind of soup, it becomes very evident that so shrewd and experienced an agriculturist would not resort to such a method of feeding unless it were strictly economical. He always took advantage of those times when a scarcity either of roots or of hay caused the prices of store sheep to be exceedingly low, and without having a single acre of turnips to give them he would buy in several hundred sheep to fold on his poorest grass lands and give them daily this kind of food in troughs, which although not very expensive was made acceptable to the palates of the animals, and proved sufficiently nutritive to make them fit for mutton at the end of their winter feeding. Mr. Randell, indeed, sometimes bought in-lamb ewes, and even then made this system of doing things perfectly remunerative.

Mr. George Adams, the well-known Oxfordshire ram-breeder, has borne testimony to his peculiar system of cutting 50 acres of his best straw into chaff for the young and store animals. As many as 250 beasts are usually fed from Christmas to May Day on this straw chaff intermixed with mangel-wurzel pulp. On an average five cartloads of root are pulped every morning to mix with the straw chaff, and 100 gallons of linseed gruel is thrown, boiling hot, over the amalgamated chaff and pulp, which thoroughly absorb it, and this is one day's allowance. The amalgamated food ferments, and the cattle eat it eagerly and do well. Mr. Adams has been accustomed to feed his ewes on the same food with two or three bushels of malt dust mixed with it each morning. His barren cows are fattened on the same food with 4 or 5 lb. of cotton or linseed cake per day each. He has borne the following testimony :—

> "If it were not for cutting up all my oat and barley straw, and about one-half of my wheat straw, to be given as food, I could not keep more than half my present stock of cattle and sheep."

The year 1868 stands in the record as conspicuous for one of the greatest failures of turnips ever known. Mr. G. Neale commenced farming near Mansfield on a sheep farm in that year, and although he did raise a crop of late common turnips, he could spare none for the cattle in the yards. He ground barley and cut straw daily on quite a wholesale scale, and described what he did otherwise as follows :—

> "I had a copper fixed and a large stone trough placed by the side of it. My plan was to boil linseed, 1 lb. per head per day, for two-year-old heifers,

A layer of chaff was placed in the trough, and the scalding linseed soup thrown over it. It was then turned over, and on it placed meal which was allowed in the proportion of 3 lb. per head per day. I can only say the plan answered all my expectations, and my cattle never did so well as when treated in this way."

If sugar or treacle can be purchased cheaper than linseed and maize or other grain it can be more easily employed, as it only requires to be infused in boiling water and the liquid thrown over the chaff, and the cost of grinding the corn would of course be saved even if home-grown corn were used; but since market prices have been so low it has been deemed desirable to consume as much as possible of the home produce instead of going to the market to buy. This is the reason, no doubt, the employment of sugars and treacle as food for stock has somewhat gone out of fashion, although these articles have in recent years been exceedingly cheap. The utility of having a soup of some kind when straw chaff is used must be very evident, the absorption which takes place causing the whole of the food to be devoured, whereas if oilcake or corn were intermixed with the chaff the animals would pick it out and not consume the whole of the less palatable food.

There is yet another way of making straw chaff palatable, that of impregnating it with condiments or spices. Very grateful aromas may be imparted in this way to tempt the olfactory nerves of cattle and sheep, so that when concocted foods of this kind are intermixed with straw chaff to which the particles adhere the animals are led to devour every bit of it, and it is well known to be possible to have condimented foods of this character that are perfectly salutary to health, and from their tonic properties may assist instead of retarding digestion and assimilation. Malt is said to act as a condiment quite as much as a food for stock, and many old, experienced farmers are so fond of using it that we may well fancy it answers even higher purposes than mere nutrition. On this subject Mr. John Ford, of Rushton, Dorset, wrote as follows on Sept. 3, 1881:—

"Malt is no doubt a very valuable article to stock-feeders on arable farms, who have plenty of straw to spare, and who require the sweetened substance to induce cattle to consume a larger quantity of straw chaff than they otherwise would do if not made palatable. Since the duty was taken off I have used from 20 to 30 qrs. of malt, and have been well satisfied with the result. My plan has been to mix the straw chaff the day before using it with a combination of linseed, cotton-cake, corn, and malt, together with pulped roots, just sufficient to moisten the chaff slightly and cause it to heat a little.'

Writing to me a year later, on October 19, 1882, Mr. Ford said:—

"I have employed a great deal of malt during the last two years, and am quite satisfied with the results. For beasts I use about 1 quart each per day mixed with cake, corn, straw-chaff, and a small quantity of mangel pulp, and I believe the malt induces the animals to consume a larger amount of dry food than they otherwise would, and by mixing the whole together the day before used the chaff is made very palatable.

The late Dr. Voelcker, in one of his published letters, made a statement respecting the action of malt when intermixed with other starchy foods which almost leads to the supposition that the diastase goes on acting on them even after being consumed. He said:—

"Malt possesses the valuable property of rendering other food more digestible, and of preserving the health of fattening stock. In order to fatten animals as economically and profitably as possible, it is necessary to supply them liberally with a variety of food. The excess of food conveyed into the system during the fattening period often greatly impairs the digestive powers and endangers their health. Malt greatly assists the dissolving action of the stomach, and thus supplies the absorbing vessels readily with liquid food. According to Payen and Peraz, the eminent French chemists, malt contains but 2-1000ths of *diastase*, a compound which, not admitting of quantitative determination, is not mentioned in my analytical results. Notwithstanding this trifling quantity, the diastase of 1 lb. of malted barley, according to Liebig, is capable of converting into sugar 5 lb. of starch. I believe, therefore, it will be found that the cellular fibre and husk of grain are more easily and thoroughly exhausted of starch when the crushed grain is mixed with a small proportion of malt than otherwise. The full fattening effects of the grain will then be realised, and none of the starch particles be carried off with the fæces. We can thus understand why a small proportion of malt produces very striking effects when added to other less digestible food. I am inclined to think that malt improves materially the feeding value of other less digestible food, not so much on account of the sugar it contains as in virtue of the peculiar dissolving action which it exercises on other articles of food. Too large an amount of sugar in food, it appears to me, may probably have the effect of nauseating; and as brewers' malt contains much sugar, it is likely that, however beneficial in small doses, such malt ought not to be given to stock in large quantities."

This scientific opinion not only vindicates very forcibly the rationale of the inclusion of malt in the general dietary of farm animals, showing that the fondness of practical farmers for it has not been a mere fancy, but peculiarly shows the fitness of the employment of malt whenever straw fodder is made to form a leading portion of the usual food. The chief objection raised against the latter has always been its indigestible nature; hence the various methods designed for cooking, steaming, and fermenting straw chaff, as well as macerating it by causing it to absorb scalding soups or liquids. The addition of malt, it seems, will promote the digestibility of the substance in another way by chemical action. Among the farmers of the present day who exhibit the greatest fondness for malt feeding, especially in con-

junction with straw chaff, may be mentioned Mr. John Treadwell, of Upper Winchendon, Bucks, who several years ago made experiments, both in sheep feeding and giving malt to dairy cows, which decided him to make it form an ingredient in the dietary of all stock receiving artificial food, and especially in numerous instances on his farm when straw chaff is largely employed.

We now approach a very necessary part of the inquiry, as to how different kinds of straw have to be classified in regard to their respective feeding values. Science aids us, to a great extent, in determining the point, but not altogether, inasmuch as chemically the straw of leguminous crops is very superior in nutritive property to that of the cereals; and this would be endorsed by experience, so far as pea straw is concerned, if the crop has been taken in good condition. In regard to bean straw, however, the hard, sticky nature of the stalks would render them scarcely fit to be chaffed for animal-feeding unless measures were taken to steam or otherwise cook or soften the chaff afterwards. There is a great difference in the value of bean straw tops, and the spent pods after the grain has been threshed out of them, compared with that of the lower parts of the stalks. The straw of seed vetches is objectionable from another cause. Owing to the lateness of the period of harvesting it is orten far otherwise than sweet and tempting, and would be rejected by cattle if offered in its natural state; but a resort to the same measures of chaffing and steaming would very materially alter this condition by making it palatable and wholesome. No treatment of straw can possibly add to it more nutritive property than it had before, but there are numerous instances of hard, sticky, indigestible straw, as well as damaged fodder of both hay and straw, containing considerable nutritive property utterly unfit to be utilised as food for stock until chopped fine and submitted to the purifying and cooking influences of steam.

The late Dr. Voelcker placed the nutritive values of different sorts of straw in the following order:—(1) Pea straw; (2) Oat straw; (3) Bean straw with the pods; (4) Barley straw; (5) Wheat straw; (6) Bean straw without the pods. The quality of straw, however, very much depends on the degree of ripeness the crop had attained when cut, which will no doubt account for the estimates of all agricultural chemists not being in perfect agreement as to the respective nutritive properties of different kinds of straw. Experienced farmers are constantly in the habit of cutting both oat and wheat crops before they are dead ripe, when they intend the straw to be utilised as fodder, well knowing that it would prove much more valuable for that purpose

without the grain suffering detriment in consequence. Indeed, oat crops are often cut when the straw is quite green, the cutting being performed just when the heads and upper parts of the stalks begin to turn yellow. No one was more appreciative than the late Dr. Voelcker of the very considerable differences which might be found in the nutritive properties of straw caused by the varied degrees of ripeness the crop had been allowed to attain before being cut, and he made several analyses which prove this. Oat straw dried for stacking, one portion of the crop yielding which had been taken rather green, another fairly ripe, and a third over-ripe, he found to give the following different percentage results :—

——	Cut rather green	Fairly ripe	Over-ripe
Water	16·00	16·00	16·00
Albuminoids . . .	8·49	4·08	3·65
Oil	1·57	1·05	1·25
Sugar, mucilage, &c. . .	16·04	10·57	3·19
Woody fibre, digestible .	26·34	30·17	27·75
Woody fibre, indigestible .	24·86	31·78	41·82
Mineral matter . . .	6·70	6·35	6·34
Total . . .	100·00	100·00	100·00

Boussingault formed his table of nutritive equivalents on the theory that different substances used as aliments are nutritive nearly in proportion to the nitrogen they contain, according to which it would take 520 parts of wheat straw, 520 of barley straw, 547 of oat straw, 611 of rye straw, but only 74 of vetch haulm dried to be equivalent to 100 parts of good hay. The estimate of M. Antoine, the French chemist, as translated by the Rev. Mr. Rham, differed considerably from this, as it held 100 parts of hay to be equal in nourishment to 374 parts of wheat straw, 442 of rye straw, 195 of oat straw, 159 of vetch haulm, 153 of peas haulm, or 340 of bean haulm.

While treating of chemical analysis a very serviceable one made by the late Dr. Voelcker, which ought, undoubtedly, to be given, was a comparison of the constituents of fermented straw chaff, prepared according to the method of Mr. Jonas, and that of ordinary straw chaff. He discovered that the fermentation to which the straw is subjected thereby had the effect, to quote his own words, " of rendering the hard and dry substance which constitutes the bulk of the straw more soluble and digestible than it is in its natural condition." In offering a comparative analysis to illustrate how much this had been effected, he also added that of common meadow hay, with the object of showing

the quantities of richer substances requisite to be added to bring fermented and improved straw up to the standard of hay. His table was as follows:—

—	Meadow hay	Straw chaff after fermentation	Wheat straw chaff
Moisture	14·61	7·76	13·33
Oil and fatty matter . .	2·56	1·60	1·74
Albuminous compounds .	8·44	4·19	2·93
Sugar, gum, &c. . . .	41·07	10·16	4·26
Digestible fibre . . .	—	35·74	19·40
Indigestible woody fibre .	27·16	34·54	54·13
Mineral matter . . .	6·16	6·01	4·21
Total . . .	100·00	100·00	100·00

Moreover, Dr. Voelcker acknowledged that Mr. Jonas's system of preparing chaff had another highly valuable feature, as he found the chaff which had been fermented possessed "an extremely delicate flavour" and "all the agreeable smell which characterises good green meadow hay, and a hot infusion with water produced a liquid which could hardly be distinguished from hay-tea."

Of course, practical farmers are well aware that the fermentation of straw chaff by other modes besides the one resorted to by Mr. Jonas, in the steaming and partial cooking of it, invariably brings out this grateful aroma, delicate flavour, and nice, palatable condition, in addition to rendering the substance more digestible, the only objection they have ever entertained against resorting to the process having been the cost. This, of course, is calculated to be much greater in certain circumstances than in others. The chaffing can be accomplished much more cheaply, as a rule, at the homesteads of large farms having steam-driven machinery than at small farms where the chaff-cutting has to be done by hand. Still, after a deficient hay harvest like that of 1892, or whenever the haystacks are small in proportion to the number of stock requiring to be fed, it must always be a matter of strict economy to fall back as a resource on chopped straw, even on the part of those unaccustomed to resort much to the chaff-cutter in ordinary seasons.

The late Mr. Charles Randell regarded hay as "the most expensive food, looking at its selling value, that a farmer can give to his cattle." On the other hand, Mr. Horsfall declared in the Journal (Vol. XVIII., 1st series, 1857, page 171) that he could buy straw for his dairy cows at a cheaper rate than any other food substance. He remarked:—

"In wheat straw, for which I pay 35*s.* per ton, I obtain for 1*s.* 2½*d.* ·50 oil and 32 lb. starch, or (the starch reduced as oil) 18½ lb., available for the production of fat or for respiration. I know no other material from which I can derive by purchase an equal amount of this element of food at so low a price."

The market value of straw has risen somewhat in most districts since this was written, and there are cases where the commodity is in so much demand for packing and other purposes connected with manufactures that it would be an error of judgment to consume more of it at home than was absolutely necessary. Mr. Willday, winner of the First Prize in Class 3 in the Warwickshire Farm Prize competition, 1892, informed me last June that he is often able to make more money of the straw of his wheat crop than of the grain. Still, even although at 50*s.* a ton, it might be economical to sell straw, and replace it for stock food with such commodities as desiccated brewers' grains, malt dust, or bran, yet these are not always within reach of all farms to be readily available, and possibly those who are able to sell straw at higher prices than it is worth to them for consumption at home are few in comparison with those who, through farming at long distances from railway stations and populous localities, could not sell their straw remuneratively even if they desired to market it.

Some farmers have always been accustomed to give their working horses double and perhaps three times as much hay as others do, those who give the lesser quantities chaffing up hay and oat straw or barley straw together, and often in the proportion of only one-third of the former to two-thirds of the latter. As it has become a recognised point in food management, even with those who give all hay and no straw, that the greater part of the hay ought to be chaffed and intermixed with the bruised corn, rather than given whole in racks, the change of policy that would substitute straw chaff for hay chaff would not entail any greater cost in preparation of the diet, unless it was considered necessary to steam or otherwise cook or macerate the straw chaff. Those unaccustomed to such a departure, and who entertain apprehensions that their animals would not be so healthy or robust in consequence, need only to consult past volumes of this Journal, and they will find ample testimony of farm horses doing remarkably well both on rations consisting of one-half hay and the other half straw chaff, and on others in which hay has been entirely dispensed with, and chopped oat or barley straw, with additions consisting chiefly of foods rich in albuminoids, substituted. A few such cases may here be quoted.

In Vol. XIV., 2nd series, 1878, page 631, Mr. John Algernon Clarke says:—

"As a rule, the old wasteful system of giving horses hay in racks, as well as the Lincolnshire practice of feeding on oat sheaves cut into chaff, has gone out of favour, and the best managers cut up hay and straw and give their horses ground corn or crushed oats, sometimes bran or pollard, with a portion of pulped roots added to the dry food."

In Vol. XXIV., 2nd series, 1888, page 447, the system of feeding of Mr. John Treadwell, Upper Winchendon, Bucks, is described to be—hay and straw chaff, with one bushel of ground maize, half a bushel of oats, and half a peck of crushed malt, per horse per week; that of Mr. T. H. Hutchinson, Catterick, Yorks, as chaffed oat straw, ground oats, bran, a few roots, and 1 lb. of linseed cake; that of Mr. H. Simmonds, Bearwood, Wokingham, when horses are in fully active work, as two bushels of oats, half a bushel of split peas, with two trusses of hay and straw chaffed per head per week; that of Mr. Gilbert Murray, Elvaston, Derby, as from 6 to 8 lb. per day of mixed meals, ground together with cut hay and straw; that of Mr. John Watts, steward to Lord Moreton, as straw chaff with some hay and two bushels of crushed oats per horse per week; and that of Mr. J. Brockie, Carmarthenshire, to be as much straw and swedes as the horses can eat, with one and a half bushel of oats each per week. In the same volume, page 465, Mr. Hunter Pringle says:—

"As hay is a severe crop on our poor light lands, I do not make much. I always have a little, but the acreage under hay is the lowest possible. I chaff it all; my work horses are allowed some during times of extra hard work; at other times they get only oat straw. I may say that on this farm four horses, each pair working a double-furrow plough, have to work 60 acres of land for roots and 125 for corn. The work is always well done and the horses are always fat and fresh."

If the hay employed be only of second-class or third-class quality, horses are just as well without it, especially if a few chopped carrots or mangel-wurzel, or a little silage or green malt, can be intermixed with the straw chaff. It is always advisable that such succulent foods should be incorporated with the manger dietary when chaffed straw, instead of chaffed hay, has to be largely resorted to. Green malt is very easily prepared, and a great many old stablekeepers have in the past been accustomed to resort to it. The process is simply that of steeping barley in vats until it sprouts and then spreading it on a floor for some days previous to use, during which some of the sproutings develop into green blades, whence the name "green malt." The cost of thus converting barley into malt is very little indeed, and it is easy enough to understand that when intermixed with straw chaff the latter would be made more

digestible. Boiled barley also forms a serviceable addition to straw chaff for horses, and they are very fond of it. Scientific as well as practical men have always deemed it good policy to substitute boiled or steeped barley for oats and beans in winter, when horses do little work, and nitrogenous food is too heating.

After the droughty year of 1887, when hay and roots were both very deficient on a great many farms, several interesting experiments on a large scale were carried out by making cattle and sheep subsist chiefly on chaffed straw with meals or soups added. In the winter succeeding that year Mr. Charles Randell fed a very large flock of sheep without giving them a single turnip or a bit of hay. On Lord Moreton's farm at Whitfield, Gloucestershire, a larger number of grazing steers and heifers were bought in than usual to be fattened on a mixed diet of which straw chaff formed the most bulky ingredient. Although 140 acres of cereal grain had been grown on this farm in 1887, estimated to yield, on the average, two tons of straw per acre, not any of the latter was used as litter, being deemed much too valuable for feeding purposes. As many as 200 cattle were fed that winter, and they consumed nearly 200 tons of straw, first reduced to chaff and boiling hot treacle syrup thrown over it. after which it was allowed to remain fermenting in heaps for at least twenty-four hours before being given to the cattle. This system of extensive straw feeding had been a favourite one with Lord Moreton and his steward, Mr. John Watts, for a great many years, and has been so ever since, a soup from boiled linseed being preferred to treacle syrup when linseed can be bought at a reasonable price. The usual feeding ration which Mr. Watts has found best for fattening cattle consists of as much as they can eat of straw chaff after being scalded and fermented, and about 100 lb. of roots, 4 lb. of meal, and 4 lb. of oilcake for each beast per day.

In his prize essay on the management of sheep in the Journal, Vol. I., 2nd series, 1865, Mr. John Coleman remarks:—

"We must make one acre of turnips keep twice as many sheep as heretofore in a far more healthy condition. Last winter (1864–5) in too many cases the difficulty was to find any roots at all, but great and lasting good may be anticipated from the evil then felt. I saw many flocks living on damp chaff with a little artificial food, and doing as well as could be wished. I have long desired to see an economical plan of pulping roots devised, as the animal might then be induced to eat a large quantity of straw chaff rendered palatable and nutritious by a small addition of artificial food. Nor would such a system be as extravagant as at first it may appear. Let us assume that our crop of turnips equals 15 tons per acre, and that instead of 20 lb. per head we give 10 lb. (amply sufficient) with 1 lb. of straw chaff and $\frac{1}{4}$ lb. a day each of artificial food, and it follows that 100 sheep will consume an acre in thirty-three days, and 7 cwt. of extra food will be spent

on each acre besides $1\frac{1}{2}$ ton of straw, so as considerably to increase our produce of corn, besides the chief object of keeping a heavier stock of breeding sheep in a healthy state."

Mr. Henry Evershed's important experiment made in the same winter as that above referred to by Mr. Coleman will always stand on record as affording clear proof as to what an extent sheep can be kept all through winter without either roots or hay, straw chaff intermixed with richer ingredients being almost entirely used. In Essex, on six adjoining farms, the number of sheep wintered was greater than they had ever carried before, solely because lambs were exceedingly low in price and likely to pay well for wintering. As many as 1,500 sheep were kept on 650 acres of arable and 350 acres of upland pasture, but the whole of the turnips and rape yielded by the arable was eaten by the ewes in September, and what mangel-wurzel had been grown was reserved for the ewes at lambing time. The lambs ran on a park in the daytime, which, however, afforded them little or nothing except exercise and water. From September 29 until November 4, 352 lambs had 5 bushels of meal daily, mixed with 468 lb. of straw chaff, the cost for meal being $3\frac{1}{2}d.$ each per week. On December 20 the food was increased to $6\frac{1}{2}$ bushels of meal and a bushel of oilcake, and on January 23 to $7\frac{1}{2}$ bushels of meal, 2 bushels of oilcake, and 2 bushels of rape cake. These lambs, purchased at 22*s.* 6*d.* in September, were valued at rather over 30*s.* each on November 4, when put on their winter feeding, the cost of which, as entered in the stock-book, was estimated as follows:—

	£	*s.*	*d.*
Corn and cake as per granary book	245	16	9
Cutting 25 tons of chaff at 6*s.*	7	13	0
Grinding 96 qrs. 6 bus. of corn at 9*d.*	3	12	6
Attendance at 19*s.* 10*d.* per week	23	16	0
Horse labour at 6*s.* per week	7	4	0
Coal 3*s.* 2*d.* per week	3	16	0
Use of 21 troughs at 3*d.* each per month . .	1	11	6
Use of 180 hurdles at 1*d.* each per month . .	4	10	0
$1\frac{1}{2}$ cwt. of rock salt	0	4	6
	298	4	3

This brought the cost of the sheep up to 47*s.* 8*d.* each, at which it is said "they would probably have been sold at a profit in April, but they were then put on grass and clover to be finished off for the shambles in summer." Mr. Evershed gave the chief point of such feeding, according to his experience, to be that of using sweet straw cut fine and softened with a sufficient quantity of boiling liquid. He says:—

"One-fourth to one-half of the meal should be boiled or steamed into soup, thrown on the chaff, and the heap chopped over and well mixed with

a wooden rake. Then stir and mix in the remainder of the meal and ground cake and round up the heap. If properly prepared the chaff becomes exceedingly sweet and palatable."

He adds :—

"Under the system detailed the health of the sheep is very satisfactory. In two flocks of 300 lambs each the first loss that occurred was at the end of January, when a lamb tumbled into the drinking-pond and was drowned."

Mr. Evershed also found the same system answer equally well for breeding ewes.

Such cases as the above are specially deserving of consideration under the peculiar set of circumstances unfolding themselves this season. The hay crop of 1892 was remarkably deficient, especially throughout the southern half of England, and although supplemented with a tolerably abundant crop of roots, the prices both of sheep and store cattle have fallen lower than has been the case for many years. This renders it desirable that their numbers should not be shortened on farms in general, and this need not take place if there be only a reasonable employment of straw as food for stock.

JOSEPH DARBY.

YEW POISONING.

WHILST the yew tree has long been regarded as possessing poisonous properties, there nevertheless appears to exist great uncertainty as to whether it will or will not prove fatal to stock in any specific case. In the following pages the subject is discussed by four writers, each of whom approaches it from a different point of view.

In addition to the various cases which are cited below may be mentioned one which, at the suggestion of Mr. Anthony Hamond, of Westacre, has been communicated by Sir W. H. B. ffolkes, Bart., Hillington Hall, King's Lynn, Norfolk, who states that, in November last, some pheasants "which were undoubtedly poisoned by eating yew leaves" were found "lying on their breasts with their wings extended." The writer adds :—

"Some years ago, when shooting through the coverts here the second time, we found about fifteen carcasses of pheasants under some yew trees. These could not have been overlooked the first time in picking up, as there was no stand anywhere near this place where so many pheasants could have been shot. My keeper informs me that it is after the pheasants have been disturbed by shooting that they take to perching in the yew trees. This may or may not be so, but at any rate, it appears that, when they take to

perching in these trees, they are apt to eat a few of the leaves. We now always drive them off the yew trees when they go to perch at night. I enclose some of the yew which poisoned the pheasants, and would like to add that never before this year have we picked up a dead pheasant anywhere near these yew trees till the coverts had been shot."

A French opinion of the yew is given subsequently (p. 703); but the subjoined passage, translated from Beissner's *Handbuch der Nadelholzkunde*, shows how the tree is regarded in Germany:—

"The green parts of the plant possess strongly poisonous properties, and are particularly dangerous to horses, asses, and cattle, which, if they eat thereof, frequently suddenly collapse. Care should, therefore, be taken not to plant yew at those places which are used by coaches in halting and starting. On the other hand, the red, fleshy coverings of the seeds exhibit none of the poisonous characteristics which have been falsely attributed to them; they are frequently eaten by children, but, if even freely partaken of, act only as an aperient."

The contributions which follow are from the respective pens of (I.) Mr. Elias P. Squarey, (II.) Mr. Charles Whitehead, (III.) Mr. William Carruthers, F.R.S., and (IV.) Dr. J. M. H. Munro.

Ed.

I.

The recent correspondence in *The Times* has furnished abundant illustration of the eccentric and apparently mysterious occurrence of yew poisoning in various classes of animals, whilst the occasional exception of yew poisoning in parks or pastures, where yew trees exist and are readily accessible to cattle, horses, and sheep, justifies a thoroughly searching inquiry into the whole question.

There has been a very prevalent belief amongst dairy people, farm labourers connected with horses, and shepherds with whom I have been associated as a farmer and land agent, that the male yew, that is, the tree emitting the pollen in volumes resembling artillery smoke at the latter end of February and in March, is the poisonous yew, whilst the female, producing the red berries in the autumn, is harmless. This belief, however, has never been tested scientifically or exhaustively.

Below are submitted a few of the most salient instances of deaths of animals—after eating, in some or other form, the foliage of yew trees—which have come within my own experience.

First, as to the Irish yew, or Florence Court Yew (*Taxus fastigiata*.) Near Brixham, in Devon, some heifers were turned into a small pasture adjoining a gentleman's residence, about the end of September last, in which stood a small specimen of Irish yew. Two of the heifers were seen nibbling the yew, and next morning were found dead. They had been driven about

five miles to this pasture in stormy weather. The soil here is New Red Sandstone.

Four horses were carting coal from the railway station to Melchott Court, Wilts. On reaching the coal cellars, the two trace-horses were taken off, and the boy having charge of them allowed them to nibble an Irish yew. The carter ordered him to move them at once, and presumably they ate very little, but both died within an hour and a half. They had brought their load about six miles. The soil is London Clay.

Secondly, as to the English yew (*Taxus baccata*). Four hundred ewes on my farm at Odstock, near Salisbury, when feeding on the Down, strayed, as they had often done before, into a large wood of yews covering nearly seventy acres. On this one occasion, during the month of October, twelve ewes were poisoned: they were opened, and the yew spines were found in them. On other occasions no harm had accrued. This farm is on the Chalk.

At Zeals, near Mere, in Wilts, the churchwarden had trimmed the yew hedge in the churchyard. His man allowed the trimmings to fall into the road. A dairy of cows of an adjoining occupier, returning along this road from milking, picked up the yew spines, and two of the cows died during the night. Zeals is on the Greensand.

Basildon Park, Berks, in which a considerable number of yew trees are found, furnishes the following instances:—

Some years ago, two hundred sheep brought from Ilsley Fair, a distance of about nine miles, were turned into the Park on a rough wet night. In the morning three were dead, and on opening them the stomach disclosed as much yew as could be held in one hand, and the coating of the stomach was destroyed. No subsequent loss of sheep or cattle has arisen in depasturing this part of the Park, though cattle have been seen picking the yew from the trees at all seasons.

A shepherd, new to the Park, was warned by an old labourer that the yews in a certain part of the Park were dangerous. He replied that his ewes were used to yews, as there were plenty on the farm (on the same estate) from which he had driven them. Next morning, after a very rough night, five were dead; and a *post-mortem* examination showed they had eaten yew.

On a very cold day in March a horse was carting hurdles between ten and twelve o'clock where it had access to a yew tree, but of which it was not observed to eat. At three o'clock it was brought in, suffering apparently from colic, for which remedies were administered. It died at 6 P.M., and on the contents of

the stomach being examined, they were found to contain a double handful of yew, and the coats of the stomach were destroyed. This tree was at once cut down. The soil here is on the Chalk in the deep Tertiary drift.

At Fonthill, in Wilts, English yew trees are scattered over the Park and sweep the ground. Cattle, sheep, and horses browse on the grass, and have free access to the trees. No case of loss or poisoning has ever been known to occur here within the forty years of my experience. This locality is underlaid by Chalk, Greensand, and Upper Oolite.

The only instance within my knowledge of the death of a donkey from eating yew occurred at Wilbury Park, Wilts, where a favourite donkey belonging to Lord Stalbridge, who then occupied Wilbury, died, I am informed, from undoubted yew poisoning. This Park had been fed by cattle, without any ill results from the yew trees, which were perfectly accessible to them. Wilbury is on the Chalk.

In May, 1891, at Hampworth, Wilts, a cock-pheasant was picked up, just dead, by a tenant, under a yew tree, and was brought to the head-keeper before becoming stiff. On opening it, in the crop and stomach were found undigested maize and yew spines. This part of the estate consists of plastic clay, sands and gravels, of the Bagshot series.

ELIAS P. SQUAREY.

II.

There is so much diversity of opinion as to the effect of the leaves and twigs of the yew tree upon farm stock that it is desirable to put concisely together what is actually known as to this from a scientific and practical point of view. The question was recently raised in the columns of *The Times*, and from the numerous letters which appeared there, and the length of time allowed for this correspondence, it must be held to be one of considerable importance. It was admitted on all sides that yew has poisonous properties, and numerous instances were given of horses, cattle, and sheep having died after eating it, but it was said by some that it was harmful only in a dry state. Others declared that the green leaves and twigs were injurious. Many believed that they were only fatal to animals in a fasting condition, and many also expressed the idea that the foliage of the female plant was harmless, and that of the male noxious.

Sufficient evidence is forthcoming to satisfy the most credulous that yew leaves are poisonous to stock. Anyone who knowingly allowed farm animals to remain within browsing dis-

tance of yew trees would be particularly foolish. But it is felt that more details are wanted, that the action of the poison contained in the yew leaves and twigs should be described, that the quantity sufficient to kill the various animals should be known, and that remedies or counteracting influences, if any, should be published. It would also be interesting to have an explanation of the fact that deer, horses, and rabbits are not found poisoned by yew. This may be because they are prevented by instinct from eating it, while stock, on account of the dependence engendered by domestication, have lost the fine instinctive perception of animals in a natural state of what to avoid. Deer in parks have frequent opportunities of eating yew. There are large game coverts in Wiltshire (and probably in other counties), notably, "The Great Yews" and "The Little Yews," belonging to Lord Radnor, composed of nothing but yew trees whose boughs sweep the ground, and undergrowths of fern, brambles, and a few stunted hazels. These swarm with hares and rabbits, none of which are ever found dead from poisoning.

There is not much in botanical works relative to the toxic properties of the yew. Withering, however, gives the following account in one of his full and characteristic notes: "The berries of the yew are sweet and viscid. Children often eat of them in large quantities without inconvenience. Swine and fieldfares are fond of them. . . . Sheep and goats eat it; horses and cows refuse it. But there are instances of both having been killed by eating it, branches having been found in their stomachs, and sheep are said to have been killed by browsing upon the bark. I suspect that the loppings in a half-dried state are most detrimental to cattle. In January, 1823, in a deep snow, Messrs. Woodward, of Chelmsford, turned out three horses into a small close adjoining which was a yew tree. In three hours they were found dead with yew in their stomachs."[1]

In agricultural works but slight mention is made of yew as injuring stock. There seems to be only one reference to it in the Journal of the Royal Agricultural Society. Marshall scarce makes allusion to yew. Arthur Young does not comment upon it in his voluminous *Annals of Agriculture*. Baxter and Morton merely mention facts as to cases of poisoning due to yew, without particular remark. It does not appear that veterinarians have specially studied the action of yew leaves upon stock, nor that toxicologists have done more than define taxine as a poisonous principle.

Speaking generally of poisonous plants, it may be said that

[1] *An Arrangement of British Plants*, by William Withering, M.D., F.R.S. 1830.

very little is known with regard to them in this country. There is no special work upon them, nor descriptions of them, except perhaps of a few of them met with occasionally in botanical works, as in Withering's *Arrangement of Plants*, and in agricultural encyclopædias. In France they are ahead of us in this matter, as a valuable publication was issued from the *Bibiliothèque de l'Enseignement Agricole* in 1887, entitled *Des Plantes Vénéneuses et des Empoisonnements qu'elles déterminent*, written by M. C. Cornevin, Professor at the National Veterinary School. All the ordinary poisonous plants which are likely to be injurious to farm animals are described, and their effect upon these as proved by experiments is detailed. The description of yew and its toxic qualities is particularly full and instructive, and as there is nothing of the kind known here, a translation of its most important points may be acceptable to stock-owners and others interested.


Twig of Yew with berries. "Fruit" and seed, shown also in section.

M. Cornevin describes the flowers as of two kinds and on separate trees, the male flowers being solitary in the axils of the leaves, with five to eight stamens bearing pollen. The female flowers are single, axillary, and sessile, having at their bases scales terminated by an ovule, surrounded by a fleshy cup.

The yew, M. Cornevin says, is classed among the most dangerous members of our flora, and though its poisonous properties have been long known, the study of its toxic principles has not yet been completed. It causes more accidents because there is nothing to warn against its poisonous properties. It has no strong repellent odour. It does not emit resin like most of the conifers, and its shiny green leaves tempt domesticated animals especially. Later on will be shown the kinds of domesticated animals which are most easily poisoned, and in what circumstances poisoning occurs. Much research, M. Cornevin states, has been made as to the parts of the yew that

are poisonous, and the following is what is actually known concerning this point.

Wood and bark of the yew.—It was formerly believed that the wood of yew was poisonous, and that liquids kept in vessels of it were harmful. It would be well to imitate the prudence of the ancients. The bark was employed in the seventeenth century as medicine. In an interesting memorandum Messrs. Chevalier, Duchesne, and Reynal deny that yew bark has any toxic quality, and this is commonly affirmed now. This, however, is wrong, as M. Cornevin's own researches have proved that it is poisonous.

Flowers of the yew.—These same authors, wishing to find out if the flowers were poisonous, administered yew pollen to a sparrow without any effect upon the bird.

Fruit of the yew.—Contrary to that which is frequently found in many poisonous plants, the fleshy fruit of the yew contains a very small quantity of poison. The simple observation of the decided taste of birds, notably thrushes, for yew berries makes this apparent. M. Clos, of Toulouse, in a work of remarkable erudition, has shown that the quantity of poison in the fruit is incomparably smaller than in the leaves, and, except in individual cases of special susceptibility, it rarely causes accidents. Uncertainty prevailed as to whether the fruit was poisonous, and as to what part was poisonous, until 1819, when Mr. R. Modlen published a circumstantial account of the poisoning of children at Oxford by yew berries. This showed that the soft part, or pulp, is not poisonous, but that the kernels contain a certain quantity of poison.

Leaves of the yew.—There is here no difference of opinion. All observers agree that the leaves contain the most poison, and are therefore most dangerous. But a distinction must be made, M. Cornevin avers, which has not before been mentioned. Researches as to the changes in the amount of the toxic principle of poisonous plants, according to the seasons, have brought to light a curious fact in connection with the yew. Contrary to that which holds in many of the Phanerogams in which the youngest shoots and tenderest leaves are most poisonous, the spring shoots of the yew are not very dangerous. As long as they retain the light green colour—their spring livery—animals can take them in large quantities without serious inconvenience. It is only when their colour has become dark green that the leaves are really dangerous. Not having proved this, M. Cornevin adds, the results presented by many writers must be accepted with reserve.

Dry leaves and twigs.—Mr. Reynal affirms that desiccation

does not destroy the poisonous properties of yew, and M. Harmand de Mongarni long since gave an account of the poisoning of a child to whom had been administered the dried leaves of yew in the form of powder.

The toxic principle of yew is insoluble in water. Following other experimenters, M. Cornevin treated yew leaves by pounding in cold water, by infusion, and by prolonged decoction. Injection under the skin, and the supply to the organs of digestion of the water employed in the processes, produced no derangement in the subjects of the experiments. But the death of a horse to which 1 lb. 7 oz. of cooked leaves was administered is proof that the poison remains in the vegetable substance, and that cooking does not destroy it.

Alcohol does not appear to be a better dissolvent than water. Ether extracts the poisonous principle from the yew. The ethereated extract of powder from the leaves is a very active poison.

The juice expressed from the green leaves, which is green at first and afterwards saffron-coloured, of a sweetish flavour, and smelling like the crushed fruit, is as actively poisonous as the leaves.

The Equidæ—horses, asses, and mules—are the animals most frequently poisoned by yew, but the Ruminants, though having less sensibility to its influence, have furnished their contingent of victims. Pigs have also succumbed occasionally; and, among the Rodents, rabbits are very sensitive to the effects of the poison.

In M. Cornevin's experiments with autumnal and winter leaves, it was proved that the quantity necessary to be taken to kill various animals at the rate of so much yew for every two pounds of live weight was :—

For the	horse	31 grains
,,	ass and mule . . .	25 ,,
,,	sheep	156 ,,
,,	goat	186 ,,
,,	cow	156 ,,
,,	pig	46½ ,,
,,	dog	124 ,,
,,	rabbit	310 ,,

Poultry of all kinds are also poisoned by the leaves of yew, but death from this cause is rare among web-footed birds, as they quickly reject the yew by vomiting.

M. Cornevin remarks from his experiments that the poison of yew does not accumulate in the organism of animals.

In Hesse the peasants formerly gave twigs of yew to their

animals in severe winters, in small quantities, but during considerable periods, without any accidents resulting. On the other hand, he states that M. Baillet gave 56 lb. of leaves to a cow in 13 days, without any untoward consequences to the animal, which had taken more than 4 lb. of leaves daily. M. Phillipaux gave 12½ grains of leaves cut up and mixed with its food, every morning for 60 days, to a young rabbit, without injury to its health, or any arrest of its growth.

Concerning the symptoms noted in animals, M. Cornevin says that, when the quantity of yew taken is small, it requires attention to discern symptoms of a specific kind. A little agitation, and slight influence upon the circulation and respiration, evinced by a rise in the temperature, are all that are caused. When the dose is greater, yet not mortal, the agitation is more pronounced. Nausea happens in the dog, pig, and duck. Sometimes instead of this there is a continual attempt to swallow, as if the animal wished to relieve its pharynx from some obstruction. A state of coma then supervenes. The pulse is slow and weak, the animal moves with difficulty, more as if overcome by sleep than from actual muscular weakness. The temperature is low, the skin and extremities are cold. The head hangs down and the eyes are half closed, and the animal is prostrate. In some cases gravid animals have suffered abortion.

In the horse, muscular tremblings have been remarked, particularly around the croup, with frequent emissions of urine.

Rumination is suspended in cattle and sheep. Flatulency with eructations is common, and occasionally vomiting.

The pig hides its head in the litter and sleeps heavily, with intermissions of vomiting and moanings.

Poultry have their feathers ruffled, the head seems too heavy, the wings hang down, and coma is overpowering.

When the quantity of poison is sufficient to cause death, two forms are common.

In the first, the two phases of excitement and coma which have been described are displayed, and terminate in death, which comes in a rapid and startling manner, in from 40 minutes, 50 minutes, one hour, two hours, or more, after the introduction of the poison into the system.

M. Cornevin gives the symptoms in a dog under whose skin 310 grains of the juice of yew leaves had been injected. These commenced three minutes after the injection, and the animal died in forty-two minutes, having been almost throughout in a comatose state.

In sheep and pigs, after a meal of leaves of yew, the same symptoms were noted as in the dog, but the process was

more slow, and death resulted after convulsions in eight, ten, or twelve hours.

With regard to horses, asses, mules and cattle, after feeding on yew it more frequently happens that there is no coma, the state of excitement is less pronounced, and sometimes is not noticed, so that death comes quickly, almost as if the animals had been struck, or poisoned by prussic acid.

As yew acts so rapidly, it is nearly always possible at once to trace it in the digestive organs by a *post-mortem* examination. The carcass of animals thus poisoned has spots, or pimples, upon it. The mucus of the mouth and pharynx is pale. The stomach is inflamed on the mucous membrane with ecchymosis of a dark-brown colour, and especially near the lower orifice. The mucous membrane of the rumen in cattle and sheep is exfoliated, and the other stomachs present similar appearances, while the small intestine is always affected, its colour being abnormal, especially in cattle. The liver undergoes the most changes, being swollen and sometimes of a violet colour, more often yellow. In cattle this is a distinct symptom. There is a normal condition of the spleen. The kidneys are larger than in the habitual state, but the lungs are only changed slightly. The heart is dilated, and the ventricles, particularly the left, are full of blood. It is often found that there is congestion of the vessels of the brain. Upon examining the contents of the stomach it is most easy to distinguish the leaves of the yew, which are still entire and even attached to the small twigs. If the *post-mortem* is made shortly after death the leaves are found to have retained their natural green colour, or yellowish-green after some time has elapsed.

M. Cornevin holds that yew does not act as an irritant, and that the inflamed state of the stomach and intestines is a secondary symptom, but that it is by its anæsthetic and narcotic influence at first, and later on by stopping the action of the heart and by affecting the respiratory system, that it shows its power. Judging by analogy, he thinks it acts upon the nerve centres.

It is added that the physician or the veterinary surgeon is rarely summoned to combat the effects of yew poisoning, as these are so rapid that there is no time, and the only thing that can be done is to have a *post-mortem* examination to satisfy friends and the owners of the animals. It is only when the quantity of poison is small and the phase of coma is prolonged, that skilled aid can avail.

According to Marmé the active principle of yew is taxine, a substance soluble in alcohol, ether, chloroform, and benzine, and hardly soluble in water. Upon letting its benzinic solution

evaporate, crystallisation is easily obtained. Taxine is strongly alkaline. Marmé found that sulphuric acid, which imparts a red colour to taxine, is a reagent by which it can be detected.

M. Cornevin, seeing that the clinical study of taxine reveals such differing symptoms, is inclined to question whether besides taxine there may not be other toxic principles in the yew, and suggests, in order to account for the rapidity of its death stroke, that there may be a chemical combination within the animal organism which causes such deadly results. He is disposed to suspect some reaction analogous to that which produces prussic acid in certain species of Amygdalus.

CHARLES WHITEHEAD.

III.

The poisonous qualities of the yew have been known from the earliest times. Galen, Dioscorides, and the old authors consider it very venomous. Our early herbalists point out the danger of eating it. Coles, in his *Art of Simpling* (1657), quotes a specific case of injury. "That it is poyson to kine will appear by what followeth. Master Wells, Minister at Adderbury in Oxfordshire, seeing some boyes breaking boughs from the yew tree in the church-yard, thought himselfe much injured. To prevent the like trespasses, he sent one presently to cut downe the tree, and to bring it into his backside. This being done, his cowes began to feed upon the leaves, and two of them within few houres dyed. A just reward." The literature of Agriculture abounds in similar well-authenticated cases. Horses, asses, oxen and sheep have repeatedly met their death from feeding on yew leaves. Birds also have been poisoned by the yew. Since the November meeting of the Council, and because of the observations made there, I have had a pheasant in very good condition sent to me which was found dead under a yew tree. Such an incident would have been sufficient to justify the old notion that "if any do sleepe under the shadow thereof, it causeth sickness, and oftentimes death." On opening the bird I found some fragments of yew leaves in the proventriculus, but none in the gizzard. Both these organs were quite healthy. The death was not caused by the few leaves I found in the first stomach, for it is necessary for all such poisons to enter the blood before their specific action can be produced. The food in the intestines was too much reduced to identify its elements, but it is very probable that an earlier supply of yew leaves had caused the death.

The symptoms of the poisoning by yew in man are clearly

recorded in the *British Medical Journal* for 1876, in a case in which only five grains of the leaves were found in the stomach. Death took place within an hour from the time the symptoms commenced. These symptoms were pallor of the face, faintness, an almost imperceptible pulse, facial convulsions, foaming at the mouth, stertorous breathing, loss of consciousness, and death. Similar symptoms have been observed in animals thus poisoned. In January, 1855, a flock of sheep broke through a hedge into a garden where there were many yew bushes. Of fifty-three, only eleven recovered from the poison. After eating the yew the sheep were unable to walk, foamed at the mouth, and were very stupid. The last died after lingering for ten days: its intestines were found to be intensely inflamed. Similar inflammation has been noticed in *post-mortem* examinations of human beings poisoned by yew.

There are, however, many cases known and recorded in which animals have browsed on yew, or been fed with it experimentally, without suffering any apparent injury. Prof. Simonds, many years ago, made such a series of experiments, giving considerable quantities of yew mixed with their food to oxen, and continuing to do so for some time without observing any appreciable influence on them. But, in estimating the value of experiments yielding no results, it should be remembered that all the individuals of the same kind of animal are not affected alike by the same poison. Similar unaccountable differences in the action of the poison have been often observed in man.

Attempts have been made to account for this difference among animals, and the cause of death has frequently been attributed to some accidental circumstances observed in fatal cases. Thus, partly withered leaves having caused death, it has been erroneously assumed that the leaves in this state are more fatal than when fresh. Again, animals taking the leaves into an empty stomach, and having died, it has been falsely assumed that an empty stomach is a necessary condition in the production of a fatal result. In other cases the animals, after eating the yew, have been observed to take a draught of water, and the water has got the credit of developing the poisonous properties of the yew. The inflammatory condition of the alimentary canal noticed in *post-mortem* examinations has been ascribed to the mechanical action of the sharp points of the leaves instead of to the presence of the irritant poison.

In Hampshire a notion has long prevailed that the sexes of the yew differ toxically. As is well known, the stamens or male organs, and the pistil or female organ, are not in the yew produced

in the same flower, as in wheat, mustard, and most plants, nor in different flowers on the same plant, as in the oak and hazel, but in unisexual flowers borne on different plants, as in the willow. It is said in Hampshire that the male plants are poisonous while the females are innocuous.

I am not aware that any experiments have been made in administering to animals the foliage of plants of each sex. The stamens and fruits have been experimented with. A quantity of staminal flowers has been given sufficient to produce poison symptoms if they contained poison, but without such symptoms being produced. In the case of fruits, it has been long known that the ripe fleshy cup containing the seed may be eaten without injury. John Gerarde, in his *Herball* (1597), says: "When I was young and went to school divers of my schoolfellows and likewise myself did eat our fills of the berries of this tree, and that not once but many times." Withering, in his *British Plants* (1796), says: "Children often eat the berries in large quantities without inconvenience;" and he adds, "three children were killed by a spoonful of the green leaves." And in our own day children eat the fleshy part of the fruit with impunity. On the other hand, when the thin crust surrounding the seed is broken, and the seed itself crushed and swallowed, fatal results have followed. It appears, then, that in the organs peculiar to the two sexes the stamens are innocuous while the seeds are poisonous.

No difference can be detected in the stem or foliage of the yew at any stage of the plant. It is only after the yew has attained a considerable age that the sex can be determined by the production of the flowers. The sex of the plant cannot depend on the presence or absence of any special secretion in the plant, for though the two kinds of flowers are usually produced on different trees, yet both kinds are not infrequently, though, of course, abnormally, found on the same tree. I cannot believe there is any foundation in fact for the asserted difference in toxical qualities in the two sexes of the yew. It would be well to have the analysis of the twigs of the two kinds of yew, which supports Mr. Squarey's view, made the subject of further investigation.

William Carruthers.

IV.

Poisonous plants, such as hemlock (*Conium maculatum*, L.), nightshade (*Atropa Belladonna*, L.), aconite, (*Aconitum Napellus*, L.), generally owe their deleterious properties to the presence of

small quantities of nitrogenous bodies, peculiar to each plant, but all belonging to the class of substances known as alkaloids. Thus the conine, atropine, and aconitine, which render the above-named plants deadly, can be extracted by more or less similar processes, and agree in a number of general reactions, although differing much one from another in specific properties, in virulence, and in physiological effect. The reputed poisonous properties of yew leaves long ago suggested to chemists the probability of their containing a specific alkaloidal poison. That the leaves of both male and female yew do contain an alkaloid of some sort can be proved by very simple tests. The leaves are unpleasantly bitter to the taste, and, when extracted with water, ether, or alcohol, they yield a solution which, after due concentration, gives a positive result with nearly all of the general tests for alkaloids which chemists are in the habit of using. Lucas, about twenty years back, appears to have been the first to extract from yew leaves a specific alkaloid, to which he gave the name *taxine*. As he succeeded in obtaining but three grains of this new substance, he was able to give only a few general properties by which succeeding investigators could recognise it.

Since Lucas's time three more searching attempts have been made to complete his description and to give the yew alkaloid a definite place amongst the chemical compounds of its class. The first was by Marmé in 1876. This chemist extracted leaves and seeds separately with ether, from which we infer that the leaves he used were probably taken from the female yew. From both leaves and seeds he separated, and to some extent purified, an alkaloid generally corresponding with the description given by Lucas, which we must therefore call taxine. He states that it is present in larger quantities in the leaves than in the seeds. (It is the seed in the botanical sense that is meant—the red outer fleshy portion of the "fruit," surrounding the seed, is destitute of any bitter flavour, and is often eaten by children.[1]) He gives a number of reactions, not one of which, however, can be called in any way characteristic of taxine or of any other known alkaloid, but rather such as are exhibited by the majority of vegetable alkaloids. He does not claim to have prepared any compound of the alkaloid in a pure state, nor does he establish or suggest a chemical formula for it. Amato and Caparelli, two Italian chemists who went over much the same ground as Marmé, in 1880 confirmed most of his results. They operated on "the green needles of the yew," and extracted them successively with ether, alcohol, distilled water, and dilute sulphuric acid.

[1] Taylor states that a much-esteemed jam is made from this portion of the fruit.

From the first two, and even from the last two, extracts these chemists obtained an alkaloid which seems to agree in most respects with the taxine of Lucas and Marmé, although Amato and Caparelli do not give it this name, but call it nulossine.

Lastly, and quite recently, Hilger and Brande have (in 1890) prepared a quantity of taxine by Marmé's process, using ether as the extracting menstruum. They employed yew *leaves* only. They give a more detailed description of the alkaloid than the previous writers, and claim to have prepared one pure compound of it. For the alkaloid itself they suggest the complicated formula, $C_{37}H_{52}O_{10}N$ (i.e. 37 combining weights of carbon, 52 of hydrogen, and 10 of oxygen, to one of nitrogen).

This brief sketch of what has been done only serves to show how little relevant to the current discussion, and how slight in itself, is our present knowledge of the yew alkaloid. We do not even know from which variety or sub-species of yew the supplies of material were obtained. There are at least three of these that merit separate treatment—common diœcious yew, the monœcious yew [1] (with male and female flowers on the same tree), and the Irish yew. The last named is reputed to be more poisonous than the common yew. No mention is made of whether the leaves were taken from a male or female tree in any case, though, as we have seen, one chemist examined the *seeds* as well as the leaves. The experimenters seem to have tried simply to confirm the report of yew being poisonous by proving it to contain an alkaloid of some kind, on which they are all agreed. Nearly all recorded work beyond this consists of purely chemical research in the direction of isolating, purifying, and studying the chemical compounds of the alkaloid found.

The direct experimental evidence as to the poisonous action or precise therapeutic properties of taxine itself, or of extracts of yew leaves, is very meagre. Taylor indeed, in his standard work on Toxicology, states that the poisonous nature of the alkaloid obtained by Marmé from yew *berries* (really, as we have seen, in greater quantities from the *leaves*) was experimentally determined by Borchers. So far I have been unable to obtain a copy of this work of Borchers—*Exper. Untersuch. ü. Wirkung des Taxin*: Göttingen, 1876—and I can only hope that publication of the reference in this place will result in the unearthing of a

[1] Mongredien, *Trees and Shrubs for English Plantations*, p. 205, thus describes it:—"*Taxus baccata Dorastoni*, with horizontally spreading branches, which give it quite a distinct appearance. This variety is monœcious, which character, if found to be constant, will entitle it to the dignity of a separate species." Hooker believes "the six supposed species of this genus to be forms of one."

copy by some metropolitan reader.[1] There is little in English works beyond the following important statement by Taylor, which has but an indirect bearing on the point under discussion. "Infusion of yew leaves, which is popularly called yew-tree tea, is sometimes used for the purpose of procuring abortion by ignorant midwives. A case of death from a person drinking this infusion is reported in the registration returns for 1838–9. In the returns for 1840 there is also one death of a female, æt. 34, referred to as having eaten the berries of the yew." The subject of poisoning by yew leaves in reference to their employment for purposes of abortion has been investigated by Chevallier, Duchesne, and Reynal.[2] Yew leaves thus appear to share a special physiological action with those of *savin*, a shrub of the same botanical tribe. Of course most toxicological and pharmaceutical manuals refer to the often reported cases of cattle poisoning by yew, but add no direct evidence.

Admitting the general weight of evidence to be in favour of yew leaves being sometimes poisonous and even fatal to animals and human beings, it does not seem to follow that taxine is the chief or only poisonous principle present, or even with any certainty (unless Borchers' experiments were conclusive) that taxine is a poisonous alkaloid.

It is rather probable than otherwise that taxine is not the only alkaloid present in the yew, it being more common for a medicinal or poisonous plant to contain several alkaloids than one. When several are present it by no means follows that all are poisonous. Amato and Caparelli, indeed, appear to have obtained a second alkaloid, or at any rate a "nitrogenous crystalline substance," in the course of their search for taxine.

Notwithstanding the general agreement, there are some discrepancies in the published accounts of taxine. All agree as to the difficulty of preparing even its salts in the pure state, but the first two say the alkaloid itself is a crystalline powder, whilst the most recent says it cannot be crystallised. Marmé describes it as having no smell, whilst Amato and Caparelli's alkaloid had a "musty smell." Marmé (followed by Dragendorff in his standard work on "Plant Analysis") says it is readily soluble in benzine, Hilger and Brande that it is insoluble in benzine. Marmé states that its solutions are not precipitated by chloride of gold or chloride of platinum, Hilger and Brande that it is precipitated by both of these reagents. The possibility of chemical change during the processes employed for extraction and purifi-

[1] It does not appear to be in the Library of the Chemical Society, or in that of the Pharmaceutical Society.

[2] *Ann. d'Hygiène*, 1855, Vol. II., pp. 94 and 335.

cation has also to be taken into account. Many alkaloids are, by such simple processes as boiling with dilute acids, changed into related substances (sometimes alkaloids, sometimes not), which of course may have totally different physiological effects. Now, in one of the memoirs cited above (Amato and Caparelli), we read that an extract containing the alkaloid was boiled for some time with dilute sulphuric acid in order to distil off a small quantity of essential oil smelling like wild fennel; it is therefore possible that Amato and Caparelli's alkaloid, at any rate, was an alteration product of that present in crude yew leaves, and not the original one.

From the foregoing remarks most readers will conclude that Mr. Squarey's ingenious explanation of the capricious occurrence of yew poisoning will derive more strength from such direct evidence and opinion as he may have collected from general sources than from any chemical reasoning that is available without considerable further research. The preliminary experiments made by Mr. Stuart Wortley under my direction, the publication of which in *The Times* had the useful effect of evoking free ventilation of the subject, and a conflict of evidence from all quarters, now appear to me, after further experiments, to afford much less support to Mr. Squarey's theory than we at first supposed. In reply to a published query I take this opportunity of stating that the leaves we used, then and since, were air-dried at a *gentle* heat, until they crumbled between the fingers, the powder thus obtained being passed through a fine sieve. As *The Times* letter shows, we followed the process of Dragendorff, the greatest living authority on the extraction of alkaloids from plants, but have since found that as regards taxine he is on two highly important points (the solubility of the alkaloid in benzine and its non-precipitation by chloride of gold, which he gives as one of its most characteristic [!] reactions) in direct contradiction with Hilger and Brande, the latest investigators of this particular alkaloid.

I have, therefore, thought it desirable to repeat the experiment on a larger scale by a modified process. Half a pound each of the powdered and sifted air-dried leaves of the male and female yew were exhaustively extracted by percolation with hot alcohol. This extraction occupied two days in each case, at the end of which time all the green colouring matter of the leaves was perfectly extracted, and the residue was entirely destitute of bitter taste. The alcoholic extracts were purified from the large mass of chlorophyll and other substances soluble in alcohol by processes unnecessary to detail, and the crude alkaloidal substance finally obtained was submitted to the usual tests, none of which unfortunately are characteristic of taxine. From both male and female leaves there was obtained a crude alkaloid

which appears to agree with taxine as described by Hilger and Brande, especially (herein differing from the descriptions of Marmé and Dragendorff) in giving an immediate and copious precipitate with chloride of gold. This substance is undoubtedly present in *both* sorts of leaves, though very possibly there is less of it in one than in the other. The great difficulty of purifying and impossibility of crystallising taxine, and the absence of any published process for its estimation, or even certain identification, stand in the way of exact information on this point.

The conclusions suggested to me from the imperfect, and to some extent conflicting, chemical evidence are :—

Both male and female yew leaves contain an alkaloid.

This alkaloid in both cases appears to agree with the taxine of Hilger and Brande. Taxine is probably the poison of the yew, but it is doubtful whether it has ever been obtained in a pure state, and its physiological effects have not been sufficiently studied. Other alkaloids are probably present in yew.

Taxine is present in fresh yew leaves as well as in those withered or air-dried. It is also present in the seeds but not in the fleshy part of the fruit.

The yew poison may be one of moderate virulence only, and may occur in greater percentage in male than in female trees, or the percentage may vary from tree to tree without distinction of sex, and this may explain the capricious occurrence of poisoning. Also the half-dried leaves would be, *cæteris paribus*, more potent than the fresh.

Further and extended chemical researches, in conjunction with physiological experiments, are necessary to clear up the matter.

The principle having a specific uterine action is possibly not the same as that which causes death.

Yew leaves merit *exhaustive* chemical examination. They contain an unusually large proportion of substances, soluble in ether and alcohol, about which (excepting chlorophyll, which is present in large quantity) we know next to nothing. Amongst these, as was pointed out in *The Times*, is an energetic reducing agent, similar in some properties to pyrogallol. The male leaves used by me yielded (dry) 9·2 per cent. to ether (including all the chlorophyll), and afterwards 28·4 per cent. to alcohol—total, 37·6 per cent. of their weight. The female leaves yielded 14·8 per cent. to ether, and then 17·9 per cent. to alcohol —total, 32·7 per cent.

It is quite true that in my own experiments I obtained a greater quantity of crude alkaloid in all its different stages of impurity from the male leaves than from the female; but I do not now regard this result as at all conclusive. As at first precipitated, taxine is exceedingly impure, and the successive stages of purification not only reduce it very largely in quantity, but, I suspect, cause an actual alteration in composition.

J. M. H. Munro.

FEEDING EXPERIMENTS ON SHEEP AND CATTLE AT WOBURN.

Recent investigations at the Royal Agricultural Society's Experimental Farm at Woburn have related to (I.) Barley and Malt as Food for Sheep; (II.) the Utilisation of Home-grown Produce as Food for Cattle; (III.) Earth-nut Cake as a Feeding Material for Cattle. The reports of these experiments are here given in the order indicated.

I.—Barley and Malt as Food for Sheep.

It has long been an article of belief with many sheep-breeders and feeders that a particular value attaches to malt as compared with barley, and that the addition of it to a feeding-diet for sheep is distinctly beneficial. The most recent experiment on the subject recorded in the Society's Journal (Vol. XIX., 2nd series, 1883) is one conducted by the late Dr. Voelcker in the winter of 1882–3, at the Woburn Experimental Farm. The general conclusion drawn from that experiment was that the difference between the feeding properties of barley, and of the malt and malt-dust produced from a like quantity of barley, was but trifling. This did not take in, it should be said, the extra cost involved in malting the barley.

The Chemical Committee of the Society agreed to my suggestion to repeat the experiment of 1882–3 with some modifications, and as, in consequence of low prices for home-grown produce, attention was being drawn more and more to the feeding of farm stock with the latter, it was decided to conduct at Woburn an experiment which should combine the question of the relative feeding-values of barley and malt, and that of the advisability of using barley in conjunction with linseed-cake as against linseed-cake given alone.

The principal modifications of the 1882–3 experiment were that, instead of feeding the sheep in one case with a certain quantity of barley, and in the other with what had originally been the same weight of barley but was subsequently "malted," both malt and malt-dust being given to the sheep, in the present series the barley was that produced on the farm, and the malt was purchased at Bedford, the nearest market-town, and was similar to that which any practical farmer in the neighbourhood wishing to feed sheep on malt would have obtained. The more highly nitrogenous malt-dust was thus not included

with it. Again, in the new experiment, the relative costs of the different foods were taken into account with reference to the respective increases they yielded. A further change was made in the number of sheep experimented upon, not eight but twenty-five sheep being placed in each trial pen, the increased number tending greatly to make the experiment more reliable. The plan of experiment was: to arrange seventy-five sheep in three pens of twenty-five sheep each; to feed the first pen with linseed-cake alone; to give to the second pen the same weight as pen 1 of a mixture of linseed-cake and barley (grittled) in equal parts; and to feed the third pen with the same weight of food, but composed of a mixture of linseed-cake, barley, and malt, in such proportions that the linseed-cake formed (as in pen 2) one-half the mixture, and that the other half was made up of barley and malt in quantities which represented *equal money values*; in other words, a certain amount of the barley was replaced by an amount of malt representing a money expenditure equal to the cost of the barley in the mixture.

The sheep were Hampshire tegs, about ten to eleven months old, and were employed to feed off a field of swedes with clover-hay and the additional foods given to them. The malt was purchased, as stated already, at Bedford, and was subsequently grittled; the barley was grown on the farm, was valued in Bedford market, and grittled before using. Linseed-cake, at the time of commencing the experiment, was very expensive, but a second lot purchased during the progress of the trial was rather cheaper. The costs of the different foods were as follow:—

		Delivered at nearest station £	s.	d.		Cost per ton, including cartage, breaking, grinding, &c. £	s.	d.
Linseed-cake	1st delivery	10	5	0	per ton	10	9	0
	2nd delivery	9	9	0	,,	9	13	0
Barley		1	5	6	per qr. of 448 lb.	7	0	0
Malt		2	0	0	per qr. of 340 lb.	14	0	0

From these figures it will be noticed that the malt was, weight for weight, just twice as dear as the barley:—

448 lb. barley cost (grittled) 28*s.*, or $\frac{3}{4}$*d.* per lb.
340 lb. malt ,, ,, 42*s.* 6*d.*, or $1\frac{1}{2}$*d.* per lb.

Accordingly, in making up the proportionate mixture for pen 3, so as to use equal money values of barley and malt, there was just one-half the quantity of malt that there was of barley. As the sheep began in pen 1 with $\frac{1}{2}$ lb. per head daily of linseed-cake, the additional foods at the commencement of experiment were:—

Pen 1.	Pen 2.	Pen 3.
½ lb. linseed-cake.	¼ lb. linseed-cake. ¼ lb. barley.	¼ lb. linseed cake. ⅙ lb. barley. $\frac{1}{12}$ lb. malt.

Swedes and clover-hay chaff were given *ad libitum*, but the quantities were weighed and recorded.

The hours and nature of the meals were as follows: at 7.30 A.M., sliced roots; 10 A.M., cake and corn with chaff; 1 P.M., sliced roots; 4 P.M., sliced roots. Samples of the different foods were taken at intervals throughout the experiment, and duly analysed. The following table represents their average compositions:—

—	Linseed-cake 1st delivery	Linseed-cake 2nd delivery	Barley (gritted)	Malt (gritted)	Clover-hay chaff	Swedes	Mangel
Moisture	13·83	13·26	18·90	15·44	18·38	88·67	87·83
Oil	10·91	11·71	2·19	2·32	—	—	—
[1] Albuminous compounds	27·31	30·73	11·23	10·75	13·50	1·19	1·62
Starch, digestible fibre, &c.	32·48	31·79	61·99	64·13	34·30	8·65	8·45
Woody fibre	9·04	7·37	3·36	4·60	25·28	·83	1·13
Mineral matter (ash)	6·43	5·14	2·33	2·76	8·54	·66	·97
	100·00	100·00	100·00	100·00	100·00	100·00	100·00
[1] containing nitrogen	4·36	4·92	1·79	1·72	2·16	·19	·26

The experiment began on December 15, 1891, and lasted until March 18, 1892, a period of 93 days, which was divided into three separate portions of 36 days, 29 days, and 28 days respectively, the sheep being weighed at the close of each period, and the additional foods being each time increased somewhat. Thus, the sheep began with ½ lb. per head daily of additional food in each of the pens, and this was increased to ¾ lb. per head daily in the second period, and to 1 lb. per head daily in the third period, during which latter swedes were replaced by mangolds. The quantity of clover-hay chaff remained much the same throughout, as also that of roots, slight variations only being experienced, although the sheep were given just the amount they would readily take. One-third of a pound of clover-hay and 18 lb. to 19 lb. of sliced roots were about the quantities which each sheep took daily at first, the clover-hay going up to nearly ½ lb. towards the close of the experiment, when full quantities of cake were given. With one exception the sheep did well, this being a sheep in pen 1 (linseed-cake), which died on March 2, but which had been ailing for some time previously. It died from acute inflammation, the result,

no doubt, of the bitter north-east wind that prevailed at the close of February. On March 18 the experiment was concluded, and the sheep were weighed at 9 A.M. They were then fasted until 5 P.M. the same day, and their fasted live-weights taken. After this they were allowed a feed, despatched by train to Nottingham, and killed there on the morning of the 21st, in the presence of Mr. Elliott, the manager of the Farm. Every carcass was labelled by Mr. Elliott, and was weighed the next morning (22nd) in his presence.

The tables on this and the next two pages give the various particulars respecting the live-weights at commencement and end of each period, as also the fasted live and carcass weights, and the gains per head :—

PEN 1.—LINSEED-CAKE.

No.	Weights at commencement, Dec. 15, 1891	Weights on Jan. 21, 1892	Weights on Feb. 19	Weights on March 18	Gain in live-weight in 93 days	Fasted live-weights, March 18	Carcass weights, March 22
	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	lb.	lb.	lb.
1	0 3 19	1 0 9	1 0 21	1 1 10	47	144	68
2	1 0 4	1 0 20	1 0 25	1 1 13	37	149	73
3	0 3 27	1 0 21	1 0 27	1 1 19	48	154	71
4	1 0 5	1 0 26	1 1 9	1 2 0	51	164	78
5	1 0 1	1 0 16	1 0 23	1 1 17	44	153	70
6	0 3 14	1 0 9	1 0 18	1 1 12	54	148	77
7	0 3 24	1 0 15	1 0 23	1 1 12	44	148	70
8	1 0 15	1 1 4	1 1 22	1 2 15	56	176	91
9	0 3 25	1 0 15	1 1 0	1 1 20	51	155	73
10	0 3 20	1 0 10	1 0 22	1 1 18	54	151	73
11	0 3 25	1 0 11	1 0 27	1 1 12	43	148	72
12	0 3 27	1 0 18	1 1 0	1 1 15	44	152	77
13	1 0 4	1 0 26	1 1 8	1 1 27	51	162	81
14	1 0 0	1 0 22	1 1 3	1 1 23	51	154	74
15	0 3 19	1 0 10	1 0 23	1 1 17	54	152	71
16	1 0 11	1 1 11	1 1 23	1 2 18	63	181	86
17	0 3 22	1 0 12	1 0 24	1 1 13	47	149	75
18	0 3 23	1 0 13	1 0 21	1 1 6	39	139	70
19	0 3 20	1 0 10	1 0 22	1 1 12	48	146	72
20	1 0 5	1 0 23	1 1 13	1 2 0	51	162	77
21	1 0 0	1 0 25	1 1 13	1 2 4	60	170	81
22	0 3 14	1 0 4	1 0 11	1 1 5	47	140	66
23	0 3 24	1 0 17	1 1 2	1 1 22	54	155	75
24	0 3 11	0 3 26	1 0 9	1 0 27	44	134	63
Total of 24 sheep	23 1 23	27 2 9	29 3 25	34 0 1	1,182	3,686	1,784
						Average weight per head	Average weight per head
Gain per head daily during each period		·53 lb.	·38 lb.	·67 lb.	·53 lb.	153·6 lb.	74·3 lb.

Gain per head daily during entire period ·53 lb.

Pen 2.—Linseed-cake and Barley.

No.	Weights at commencement, Dec. 15, 1891	Weights on Jan 21, 1892	Weights on Feb. 19	Weights on March 18	Gain in live-weight in 93 days	Fasted live-weights, March 18	Carcass weights, March 22
	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	lb.	lb.	lb.
1	0 3 24	1 0 16	1 0 26	1 1 13	45	147	71
2	1 0 0	1 0 16	1 0 20	1 1 5	33	142	71
3	0 3 24	1 0 12	1 0 22	1 1 6	38	141	61
4	1 0 7	1 0 22	1 0 27	1 1 20	41	153	74
5	1 0 1	1 0 12	1 0 18	1 1 8	35	143	65
6	0 3 15	1 0 0	1 0 8	1 0 20	33	128	56
7	0 3 23	1 0 16	1 0 25	1 1 9	42	144	70
8	1 0 15	1 1 10	1 1 22	1 2 17	58	179	85
9	0 3 25	1 0 15	1 0 25	1 1 10	41	147	71
10	0 3 20	1 0 12	1 0 22	1 1 8	44	143	71
11	0 3 25	1 0 11	1 0 22	1 0 26	29	134	63
12	0 3 27	1 0 14	1 0 23	1 1 12	41	146	68
13	1 0 4	1 0 21	1 1 5	1 1 22	46	158	75
14	1 0 1	1 0 11	1 0 12	1 1 3	30	139	73
15	0 3 19	1 0 13	1 0 25	1 1 20	57	153	73
16	1 0 11	1 1 8	1 1 17	1 2 4	49	169	86
17	0 3 22	1 0 18	1 1 3	1 1 20	54	155	76
18	0 3 23	1 0 16	1 0 17	1 1 3	36	139	67
19	0 3 21	1 0 13	1 0 25	1 1 13	48	149	75
20	1 0 5	1 0 23	1 0 26	1 1 15	38	150	75
21	1 0 0	1 0 14	1 0 21	1 1 7	35	143	69
22	0 3 13	1 0 4	1 0 14	1 1 0	43	137	67
23	0 3 24	1 0 15	1 0 25	1 1 10	42	146	73
24	0 3 11	1 0 1	1 0 12	1 1 4	49	139	60
Total of 24 sheep	23 1 24	27 1 8	29 0 14	32 1 23	1,007	3,524	1,695
						Average weight per head	Average weight per head
Gain per head daily during each period		·50 lb.	·29 lb.	·56 lb.	·45 lb.	146·8 lb.	70·6 lb.

Gain per head daily during entire period ·45 lb.

As one sheep died in pen 1 before the experiment concluded, the fairest comparison will be obtained by omitting the corresponding sheep in each of the other pens (the initial weights of all three were within a pound of one another at the commencement of the experiment), and thus reckoning the experiment as if conducted with twenty-four sheep only in each pen.

The average losses per head in fasting were:—

Pen 1	(Linseed-cake)	5·12 lb.
„ 2	(Linseed-cake and barley)	4·72 lb
„ 3	(Linseed-cake, barley, and malt) . . .	5·92 lb.

These results show that during each of the three separate periods the greatest increase in live-weight was given by the linseed-

PEN 3.—LINSEED-CAKE, BARLEY, AND MALT.

No.	Weights at commencement, Dec. 15, 1891	Weights on Jan. 21, 1892	Weights on Feb. 19	Weights on March 18	Gain in live-weight in 93 days	Fasted live-weights, March 18	Carcass weights, March 22
	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	lb.	lb.	lb.
1	0 3 25	1 0 7	1 0 20	1 1 9	40	140	65
2	1 0 0	1 0 9	1 0 19	1 1 11	39	146	71
3	0 3 24	1 0 13	1 0 22	1 1 11	43	145	72
4	1 0 7	1 0 22	1 1 3	1 1 21	42	156	78
5	1 0 0	1 0 13	1 0 25	1 1 11	39	145	71
6	0 3 16	1 0 2	1 0 16	1 1 8	48	143	69
7	0 3 22	1 0 10	1 0 20	1 1 9	43	144	66
8	1 0 17	1 1 7	1 1 21	1 2 7	46	168	81
9	0 3 23	1 0 8	1 0 14	1 1 5	38	140	67
10	0 3 20	1 0 11	1 0 25	1 1 16	52	150	71
11	0 3 25	1 0 13	1 0 19	1 1 17	48	151	75
12	0 3 27	1 0 16	1 1 2	1 1 19	48	154	72
13	1 0 4	1 0 16	1 1 4	1 1 18	42	152	75
14	1 0 1	1 0 15	1 1 0	1 1 15	42	149	74
15	0 3 19	1 0 11	1 0 17	1 1 4	41	140	68
16	1 0 12	1 1 1	1 1 11	1 2 5	49	167	82
17	0 3 21	1 0 1	1 0 10	1 0 21	28	127	61
18	0 3 22	1 0 15	1 0 26	1 1 18	52	153	74
19	0 3 21	1 0 12	1 0 19	1 1 16	51	148	69
20	1 0 5	1 0 20	1 1 2	1 1 14	37	149	70
21	1 0 0	1 0 18	1 1 0	1 1 16	44	150	77
22	0 3 14	1 0 11	1 0 19	1 1 7	49	142	67
23	0 3 26	1 0 16	1 0 27	1 1 21	51	154	75
24	0 3 9	0 3 24	1 0 7	1 0 22	41	127	59
Total of 24 sheep	23 1 24	26 3 11	29 0 12	32 3 13	1,053	3,540	1,709
						Average weight per head	Average weight per head
Gain per head daily during entire period		·44 lb.	·36 lb.	·62 lb.	·47 lb.	147·5 lb.	71·2 lb.

Gain per head daily during entire period ·47 lb.

cake; next to it, though but slightly superior to the linseed-cake and barley mixture, coming the mixture which included malt.

The sheep were sold by carcass weight at Nottingham, the price obtained being 5*s.* 4*d.* per stone of 8 lb. The following table gives the carcass weights of the twenty-four sheep comprising each pen, and the money returns:—

—	Carcass weights	Value at 5*s.* 4*d.* per stone (8lb.)	Gain over Pen 2	Gain over Pen 3
	lb.	£ *s.* *d.*	£ *s.* *d.*	£ *s.* *d.*
Pen 1 (linseed-cake)	1,784	59 9 4	2 19 4	2 10 0
Pen 2 (linseed cake and barley) . .	1,695	56 10 0	—	—
Pen 3 (linseed-cake, barley, and malt)	1,709	56 19 4	0 9 4	—

It remains now to consider at what extra cost of feeding the above gains of pens 1 and 3 above pen 2 were obtained. Inasmuch as roots and clover-hay chaff were given in all three cases alike, and as the amounts of these consumed by each set of twenty-four sheep were almost the same, it is only necessary to take into account the *additional* foods used and their cost. The foods consumed by the respective pens during the entire period were:—

Food	Total food consumed in 93 days by 24 sheep	Cost of food consumed	Cost per head during entire period	Average weight of food consumed per head daily
	lb.	£ s. d.	s. d.	lb.
Pen 1.				
Linseed-cake . . .	1,626	7 3 2	6 0	·73
Clover-hay chaff .	854	—	—	·38
Roots	42,777	—	—	19·16
Pen 2.				
Linseed-cake . . .	813	6 2 4	5 1	·365
Barley	813			·365
Clover-hay chaff . .	846	—	—	·37
Roots	42,360	—	—	18·97
Pen 3.				
Linseed-cake . . .	813	6 19 3	5 10	·365
Barley	542			·243
Malt	271			·122
Clover-hay chaff . .	846	—	—	·37
Roots	43,128	—	—	19·32

From this table and the preceding one the following conclusions can now be drawn:—

(*a*) The extra return in pen 1 (linseed-cake) over pen 2 (linseed-cake and barley) of 2*l*. 19*s*. 4*d*. was obtained at the extra expenditure in additional food of 1*l*. 0*s*. 10*d*. (7*l*. 3*s*. 2*d*., less 6*l*. 2*s*. 4*d*.), and the feeding with linseed-cake alone was more remunerative than feeding with a mixture of linseed-cake and barley in equal quantities.

(*b*) The extra return in pen 3 (linseed-cake, barley, and malt) over pen 2 (linseed-cake and barley) of 9*s*. 4*d*. was obtained at the extra expenditure in additional food of 16*s*. 11*d*. (6*l*. 19*s*. 3*d*., less 6*l*. 2*s*. 4*d*.), and thus the addition of malt to the mixture of linseed-cake and barley did not prove advantageous.

From these results it must be concluded that it is more profitable to feed sheep on linseed-cake alone than on one-half linseed-cake and one-half barley; also that the partial substitution of malt for barley is not attended with any benefit.

Furthermore, it must be remembered that linseed-cake has a considerably higher manurial value than either barley or malt, and thus the value of the cake-feeding is still more enhanced. This experiment would therefore show that, even with linseed-cake at a high figure, it pays better to feed sheep with it when eating off roots than to use even home-grown barley to partly lessen the cost. Also, that malt as a feeding material for sheep does not repay its extra cost.

II.—The Utilisation of Home-grown Produce as Food for Cattle.

The continued low prices obtainable for grain-crops grown on the farm suggested the carrying out of an experiment at the Society's Farm at Woburn during the winter of 1891-2, in order to ascertain the practical difference between feeding bullocks entirely upon crops produced on the farm as against feeding them with *imported* articles such as linseed-cake. The foods which it was decided to contrast were, in the one case linseed-cake, as representing foreign produce, and in the other case a mixture of beans, oats, and barley, as representing home-grown produce.

Twelve Hereford bullocks were weighed on November 28, 1891, and divided into two lots of six each.

Lot I. was to receive:

Beans, Oats, Barley	in equal proportions
Swedes	*ad libitum*
Clover-hay chaff . .	"

Lot II. was to receive:

Linseed-cake	
Swedes . . .	*ad libitum*
Clover-hay chaff . .	"

The costs of the different foods were:—

—	Delivered at nearest station	Cost per ton, including cartage, breaking, grinding, &c
	£ s. d.	£ s. d.
Linseed-cake (first delivery) . . .	10 5 0 per ton	10 9 0
Linseed-cake (second delivery) . . .	9 9 0 " "	9 13 0
Beans	2 0 0 per qr. of 504 lb.	9 9 0
Oats	1 5 0 " " 336 "	9 3 0
Barley	1 5 6 " " 448 "	7 0 0

Samples of the foods were taken from time to time for analysis, and the following represent their average compositions :—

—	Linseed-cake (first delivery)	Linseed-cake (second delivery)	Bean-meal	Oats (crushed)	Barley (grittled)	Clover-hay chaff	Swedes	Mangel
Moisture	13·83	13·26	18·72	15·16	18·90	18·38	88·67	87·83
Oil	10·91	11·71	2·01	5·44	2·19	—	—	—
[1] Albuminous compounds	27·31	30·73	23·25	12·06	11·23	13·50	1·19	1·62
Starch, mucilage, and digestible fibre	32·48	31·79	46·55	55·43	61·99	34·30	8·65	8·45
Woody fibre	9·04	7·37	6·29	9·06	3·36	25·28	·83	1·13
[2] Mineral matter (ash)	6·43	5·14	3·18	2·85	2·33	8·54	·66	·97
	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00
[1] containing Nitrogen	4·36	4·92	3·72	1·89	1·79	2·16	·19	·26
[2] including Sand	1·27	·37	·45	1·18	·56	1·03	·04	·07

The beans were ground into meal, the oats were crushed, and the barley was grittled.

As the bullocks were more forward than those usually obtained for the feeding experiments conducted at the Farm, the quantity of food given to them was proportionately more. The experiment lasted from November 28, 1891, to March 14, 1892, a period of 107 days, this being divided into three separate portions of 52 days, 31 days, and 24 days, at the end of each of which the live-weights of the bullocks were taken.

The clover-hay chaff and roots were given as the animals would take them, but were weighed out to them, and anything left untouched was weighed back. The quantities did not vary much throughout the experiment. Swedes were given until February 7, and then mangel was substituted. From 45 lb. to 46 lb. of roots per head was about the daily amount all along, and from 13½ lb. to 14½ lb. of clover-hay chaff. Equal weights of the mixed diet of beans, oats, and barley (mixed in equal proportions) and of linseed-cake were given. The bullocks began with 6 lb. per head daily of the mixture or of linseed-cake; this was increased on January 3 to 7½ lb., on January 19 to 9 lb., on February 7 to 9¾ lb., on February 20 to 10½ lb., and finally to 12 lb. per head daily from February 28 until the close of the experiment.

The recording of the live-weights was done as follows:— The bullocks received an evening meal at 4.30 P.M.; their

allowance of water was then removed, and no more food was given them; at 9 A.M. next day they were weighed, and not fed again until the weighing was over. In this way the possible discrepancies arising from the animals having taken a feed, or having drunk a lot of water only shortly before weighing them, were guarded against.

The final weighings were taken on March 14, at 9 A.M., after a fast since 5 P.M. on the previous evening, and the *fasted* live-weights were taken at 5 P.M. on the 14th, after which the bullocks were sent by rail to Nottingham, where they were killed on the 15th inst. in presence of Mr. Elliott, the manager of the Farm. The carcass weights were taken the next day, also in Mr. Elliott's presence. The price realised was 7*d.* per lb., or 4*s.* 8*d.* per stone of 8 lb. dead-weight. The following tables give the live-weights at commencement and end of each period, the fasted live-weights and carcass weights, as well as the price obtained for each lot, and the respective gains per head in either case.

I.—*Six Hereford Bullocks fed on Home-grown Produce (Beans, Oats, and Barley in equal proportions) with other Foods.*

No.	Weights at commencement, Nov. 28, 1891			Weights on Jan. 19, 1892			Weights on Feb. 19			Weights on March 14			Gain in live-weight in 107 days		
	cwt.	qr.	lb.	cwt.	qr.	lb.	cwt.	qr.	lb.	cwt.	qr.	lb.	cwt.	qr.	lb.
1	10	0	8	10	3	0	11	0	26	11	3	0	1	2	20
2	10	3	3	11	2	9	12	0	3	12	3	23	2	0	20
3	11	0	0	12	0	10	12	2	3	13	0	5	2	0	5
4	10	0	19	11	0	12	11	2	7	12	1	0	2	0	9
9	10	1	20	10	2	17	11	0	19	11	1	21	1	0	1
10	10	2	11	11	3	2	12	1	21	13	0	13	2	2	2
—	63	0	5	67	3	22	70	3	23	74	2	6	11	2	1
Gain per head daily during each period				1·76 lb.			1·81 lb.			2·80 lb.			2·01 lb.		

II.—*Six Hereford Bullocks fed on Foreign Produce (Linseed-cake) with other Foods.*

No.	Weights at commencement, Nov. 28, 1891			Weights on Jan. 19, 1892			Weights on Feb. 19			Weights on March 14			Gain in live-weight in 107 days		
	cwt.	qr.	lb.	cwt.	qr.	lb.	cwt.	qr.	lb.	cwt.	qr.	lb.	cwt.	qr.	lb.
5	10	2	3	11	1	16	11	3	22	12	2	19	2	0	16
6	10	2	27	11	2	9	11	2	26	12	1	18	1	2	19
7	10	2	25	11	1	16	11	3	27	12	3	5	2	0	8
8	10	0	7	10	3	4	11	2	5	12	1	17	2	1	10
11	11	1	5	11	2	22	12	1	3	12	3	27	1	2	22
12	9	2	20	10	0	10	10	2	27	11	1	13	1	2	21
—	63	0	3	66	3	21	70	0	26	74	2	15	11	2	12
Gain per head daily during each period				1·40 lb.			1·98 lb.			3·42 lb.			2·03 lb.		

I. *Bullocks fed on Home-grown Produce (Beans, Oats, Barley).*

No.	Live-weights on farm			Fasted live-weights in cwt. qr. lb., also in stones of 14 lb.					Loss in fasting	Carcass weights in stones of 8 lb.		Price realised at 4*s.* 8*d.* per stone (8 lb.) dead-weight		
	cwt.	qr.	lb.	cwt.	qr.	lb.	st.	lb.	per cent.	st.	lb.	£	*s.*	*d.*
1	11	3	0	11	1	20	91	6	2·73	95	4	22	5	8
2	12	3	23	12	1	0	98	0	5·44	103	7	24	4	9
3	13	0	5	12	2	17	101	3	3·01	105	5	24	12	11
4	12	1	0	11	2	20	93	6	4·66	97	3	22	14	5
9	11	1	21	11	0	10	88	10	3·04	94	5	22	1	7
10	13	0	13	12	2	0	100	0	4·69	104	2	24	6	6
—	74	2	6	71	2	11	572	11	Average 3·93	601	2	140	5	10
Average per head										100	2	23	7	8

II. *Bullocks fed on Foreign Produce (Linseed-cake).*

No.	Live-weights on farm			Fasted live-weights in cwt. qr. lb., also in stones of 14 lb.					Loss in fasting	Carcass weights in stones of 8 lb.		Price realised at 4*s.* 8*d.* per stone (8 lb.) dead-weight		
5	12	2	19	12	1	0	98	0	3·31	104	4	24	7	8
6	12	1	18	12	0	20	97	6	1·86	102	2	23	17	2
7	12	3	5	12	1	3	98	3	4·04	103	0	24	0	8
8	12	1	17	11	3	14	95	0	4·24	99	1	23	2	7
11	12	3	27	12	1	13	98	13	4·80	104	7	24	9	5
12	11	1	13	10	3	0	86	0	5·42	93	6	21	17	6
—	74	2	15	71	2	22	573	8	Average 3·95	607	4	141	15	0
Average per head										101	2	23	12	6

The amounts of food consumed by the two sets of bullocks, and the costs of the extra foods between which the comparison was made, were as follows:—

Food	Total weight consumed in 107 days by 6 bullocks			Average per head daily	Cost of total food consumed in 107 days by 6 bullocks						Cost per head during 107 days		
	cwt.	qr.	lb.	lb.	£	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d.*
I. *Home-grown Produce.*													
Beans	15	2	16	2·73	7	7	9	20	0	5	3	6	9
Oats	15	2	16	2·73	7	3	2						
Barley	15	2	16	2·73	5	9	6						
Clover-hay chaff . .	79	3	18	13·94									
Roots	264	1	21	46·13									
Water	217	2	14	37·96									
II. *Foreign Produce.*													
Linseed-cake	46	3	20	8·18				23	7	2	3	17	10
Clover-hay chaff . .	77	1	7	13·48									
Roots	258	0	17	45·03									
Water	213	1	14	37·22									

The conclusion is come to from this and the preceding table that the increased money return of 4*s*. 10*d*. (23*l*. 12*s*. 6*d*. less 23*l*. 7*s*. 8*d*.) for each bullock fed on the foreign produce was obtained at the extra cost of 11*s*. 1*d*. (3*l*. 17*s*. 10*d*. less 3*l* 6*s*. 9*d*.) Thus, the feeding with beans, oats, and barley resulted in the obtaining of practically as heavy an animal, but at a less expenditure of 6*s*. 3*d*. per head. This shows that the utilisation of home-grown produce in the form of a mixture of beans, oats, and barley may be carried out in the case of bullocks to quite as much advantage as feeding with linseed-cake. Of course it must be borne in mind that the price of linseed-cake was, at the time of experiment, decidedly high, and, if calculation be made, it will be found that had the linseed-cake cost 16*s*. per ton less, the results of the two ways of feeding would have been practically the same. As the linseed-cake cost on the average of the two deliveries 9*l*. 16*s*. per ton delivered on the farm, it may be shown as the result of this experiment that, with the present low prices of home-grown produce, equally good returns may be obtained by feeding bullocks on home-grown produce composed of beans, oats, and barley as by feeding them on pure linseed-cake of good quality (containing, say, 11 per cent. of oil) when the latter costs 9*l*. per ton.

In certain respects this result appears somewhat at variance with the experiment on sheep, which is recorded on pages 716 to 723, wherein it was found that feeding with linseed-cake alone, even at the then high cost of the cake, proved more profitable than replacing the cake to the extent of one-half by barley. But, apart from the differences of the two classes of animals, and the fact that the sheep were feeding in the open while the bullocks were under cover in warm boxes, there is the question as to how far the value of the home-grown mixture was affected by the inclusion of bean-meal as well as of oats in it, so that the result cannot be taken as conclusive so far as concerns the utilisation of barley alone by cattle. It would appear desirable to carry out further experiments on this point. But, meanwhile, this experiment will be useful in showing that feeding with linseed-cake may, without fear of loss, be replaced by using a good mixture of home-grown foods, including beans, whenever the price of linseed-cake rises above 9*l*. per ton delivered.

III.—Earth-nut Cake as a Feeding Material for Cattle.

Simultaneously with the experiment which has just been described, another was carried out on a smaller scale, in order to test the feeding value of earth-nut or ground-nut cake.

This cake is made by crushing the seeds and seed-pods of *Arachis hypogea*, a plant cultivated extensively on the northern coast of Africa, and also largely in India, more particularly in Southern India. Large quantities of the seed-pods are exported from Pondicherry (Madras), and go principally to Mediterranean ports, the oil, after crushing of the seeds, being used for adulterating olive oil and for other purposes. The refuse cake is used for feeding cattle, both on the Continent and in India. Very little of the cake has as yet been brought over to this country, but as there was some likelihood last year (1891) of a trade in it developing, it was thought well to try at the Woburn Experimental Farm how the material would do as a food for cattle. The principal objections to its use are that, owing to the rough method of pressure employed, the cake is often apt to have some amount of horse-hair or bits of rough sacking (from the bags used in pressing out the oil) attached to it, and that it is very liable to turn rancid and to become sour. These points should be guarded against. The cake supplied to Woburn was fairly free from pieces of sacking, and any which were noticed were picked out before the cake was given to the animals; it was also free from rancidity, but was, however, slightly acid.

Four Hereford bullocks were fed from November 28, 1891, to March 14, 1892 (107 days), with a mixture of earth-nut cake, oats, and barley in equal proportions, and received in addition about 45 lb. of roots and 15 lb. of clover-hay chaff per head daily. The experiment was thus parallel to that with beans, oats, and barley, described in the previous article, the only difference being that earth-nut cake was used in place of beans, so that the present may be considered as a trial of earth-nut cake against bean-meal. The cost of the earth-nut cake was 8*l*. 4*s*. a ton, delivered at the nearest station, which, with cartage, breaking, &c., brought the price up to 8*l*. 8*s*. a ton. Analyses of average samples, taken during the experiment, gave the following composition:—

Moisture	10·77
Oil	8·47
[1] Albuminous compounds	47·44
Starch, digestible fibre, &c.	22·27
Woody fibre	4·53
[2] Mineral matter (ash)	6·52
	100·00

[1] containing nitrogen . . . . . . 7·59
[2] including sand . . . . 2·62

The course of feeding was similar to that with the bean-meal,

the cattle beginning with 2 lb. per head daily of the cake (or 6 lb. of the mixture of earth-nut cake, oats, and barley), and gradually increasing to 4 lb. of the cake (or 12 lb. of the mixture). The bullocks did perfectly well on the cake, and there was no difficulty whatever in getting them to eat it, nor any harm from its somewhat acid character. The following table gives the main results :—

Four Hereford Bullocks fed on Earth-nut Cake, Oats, and Barley, with Roots and Clover-hay Chaff.

No.	Weights at commencement, Nov. 28, 1891			Weights on Jan. 19, 1892			Weights on Feb. 19			Weights on March 14			Gain in live-weight in 107 days		
	cwt.	qr.	lb.	cwt.	qr.	lb.	cwt.	qr.	lb.	cwt.	qr.	lb.	cwt.	qr.	lb.
1	11	1	14	12	1	8	12	3	10	13	1	5	1	3	19
2	10	0	24	11	0	20	11	2	10	12	0	14	1	3	18
3	10	2	12	11	2	18	12	0	11	12	1	26	1	3	14
4	9	3	6	11	1	0	12	0	10	12	2	0	2	2	22
—	42	0	0	46	2	0	48	2	13	50	1	17	8	1	17
Gain per head daily during each period				2·42 lb.			1·91 lb.			2·08 lb.			2·19 lb.		

No.	Fasted live-weights in stones of 14 lb.		Loss in fasting	Carcass weights in stones of 8 lb.		Price realised at 4s. 8d. per stone (8 lb.) dead-weight			Cost of additional food (earth-nut cake, oats, barley) consumed in 107 days			
	st.	lb.	per cent.	st.	lb.	£	s.	d.		£	s.	d.
1	102	4	3·82	102	3	23	17	9	Earthnut	4	7	7
2	93	9	3·46	97	5	22	15	7	Oats .	4	15	5
3	97	2	2·71	98	1	22	17	11	Barley .	3	13	0
4	98	4	1·71	101	4	23	13	8				
—	391	5	Average 2·92	399	5	93	4	11		12	16	0
Average per head .				99	7	23	6	3		3	4	0

Comparing these results with those obtained in the experiment with beans, oats, and barley, we have :—

——	Daily gain per head in live-weight	Carcass-weight per head (8 lb. stone)		Price realised per head at 4s. 8d. per stone			Cost per head of additional foods		
	lb.	st.	lb.	£	s.	d.	£	s.	d.
Bullocks fed on beans, oats, and barley	2·01	100	2	23	7	8	3	6	9
" " earth-nut cake, oats, and barley . .	2·19	99	7	23	6	3	3	4	0

Accordingly, each beast fed on earth-nut cake realised 1*s.* 5*d.* less, but cost 2*s.* 9*d.* less to keep than a similar one fed on bean-meal.

The earth-nut cake, therefore, proved to be a useful feeding material for cattle, and to have a feeding value just about equal to that of beans.

J. AUGUSTUS VOELCKER.

HISTORY OF THE ENGLISH LANDED INTEREST.[1]

THE Royal Agricultural Society of England, happily styled "the great agricultural schoolmaster," should heartily welcome Mr. Garnier, not only for that which we have already received, but also for his promise to continue from the Revolution in 1689 to the present time his *History of the English Landed Interest.* He further leads us to hope that with due encouragement he may some day or other undertake an entire History of English Agriculture.

I can in all sincerity assure Mr. Garnier that we all of us await with impatience the advent of an agricultural Dr. Samuel Smiles, who would do for the still unwritten history of agriculture that which the eminent author in question has done for industrial history and biography. Technical education clamours for technical historians: education implies a craving for information; curiosity is awakened, and curiosity demands historical satisfaction.

Day by day we more and more appreciate the importance of the mutual relations of all those departments of knowledge which so brilliantly illuminate the everyday life of our enterprising and busy land.

In nature, written on the face of it, there is a law of interdependence—a law of nature equally applicable to art. Well would it be if in our agricultural art history could alike impart to statesmen and to agriculturists—to governors and governed—a due and guiding sense of artistic proportion. Then, as is now frequently the case, all-precious time might not be dissipated in the vain expectation of creating the most impossible Utopias in the most unlikely places.

[1] *History of the English Landed Interest: its Customs, Laws, and Agriculture.* By RUSSELL M. GARNIER, B.A. Oxon. Pp. 406. London: Swan Sonnenschein & Co. 1892.

A history of British agriculture would in great measure be a history of civilisation, au important part of the history of the world; it should be a review which gives back life and value to the dead past for the instruction and guidance of the living present.

All historians may be, and should be, subjected to certain tests. As to the historian's object—in Mr. Garnier's case, we have a clear-headed man seeking to instruct his own mind on subjects concrete to his own professional duties. Finding as a professional land-agent, so much in the English land-system inexplicable without the master-key of history, he determined to give effect to a general principle, universally applicable—namely, a man should study especially that history which has an immediate application to his own position in life. We are next to inquire in regard to an historian's sources of knowledge: a scholarlike and well-read man, a Bachelor of Arts of Oxford, Mr. Garnier has been well taught that the education of a man of open mind is never ended; as becomes a scholar he gives full references to his authorities—a goodly list, sufficient perhaps, but not exhaustive. The exactness of the historian in sifting and weighing evidence is to be considered together with his tendencies and bias. I tested our author in this respect by considering his treatment of a very vexed question, namely tithe: I think from a slightly ecclesiastical point of view he has treated that thorny question in a calm, just, and judicial manner. Further we have to consider the historian's profession and his general character. Mr. Garnier modestly bases his qualification for the task on many years of practical experience coupled with much personal intercourse with all the various industries connected with land and employed on large estates. In short, the author is a rare and precious combination of practical experience together with scholarship. Well knowing the difficulties of the task Mr. Garnier has undertaken, I venture to compliment him on having "set so stout a heart to so steep a brae."

The essential importance of full references to authorities is unquestionable; in this respect, as I have observed, Mr. Garnier leaves nothing to be desired. Difficulty in reading economic history is often experienced in regard to money and prices, and their relation to values in our day. I do not know whether our author might have helped his readers in this respect, and as regards population by tabular statements or otherwise. Money, so useful in comparing present values, is a useless standard in estimating bygone expenditure. Corn is only an approximate standard whilst people are so poor as to possess only the neces-

saries of life. Mulhall in his large *Dictionary of Statistics*, 1892, gives the prices of wheat per ton from about the year 1400 down to the present time and in decennial periods, the prices being further reduced to English money of the present day. These tables I have not tested: A.D. 1401–10, the average price of wheat was per ton 1*l.* 8*s.*; 1881–9, per ton 9*l.* 5*s.* The population of England in 1066 was, according to the same authority, 2,150,000, or 37 persons to the square mile; in 1889, 29,016,000, or 500 to the square mile.

There is often a certain fascination in notes—notes upon notes—that last infirmity of the bookish mind. I observe, however, Mr. Garnier has cleverly incorporated most things he desired to say in his text; he gives a sufficient glossary, which might with advantage be extended, and an excellent but not perfect index which goes far towards making his work a professional text-book; because the index enables the reader in business hours to grasp at once the golden grain of workaday facts, the cortications of pleasant and pictorial illustration may serve in intervals of ease to excite profitable and pleasurable rumination.

With considerable success Mr. Garnier has achieved the difficult task of clothing the dry bones of technical history with the flesh and blood of vivid pictorial descriptions of rural and domestic life. Some might prefer an historical text-book, pure and simple—the few perhaps who browse in great libraries; but the numerous class of readers for whom the book is designed no doubt like a chatty and pleasant digest somewhat in the nature of an essay. Mr. Garnier justly observes, "The casual reader is a numerous class amongst the rural population"—and certainly a very dry record discourages nibbling curiosity. After all, whoever desires to gain a hearing must please. It has been well said that abstracts, abridgments, and summaries have the same use as burning glasses—to collect the diffused rays of wit and learning and make them point with warmth and quickness. To Mr. Garnier we should not attribute the all-discerning eye of genius, but rather the tutored vision of an able and busy man of business of great practical experience. In short, we have no right to expect to find in Mr. Garnier a combination of Lord Bacon, Mr. Hallam, and Lord Macaulay.

Probably in varying degree the genius or ability of any historian is most manifest in the power of clearly defining those epochs in history, those unquestionable turning points, which are the cloud-capped peaks in the great chain of the mountain ranges of historic time.

History in the modern acceptation of the term is a narrative

of events, together with a scientific balance of evidence and probabilities, and an exposition of cause and effect combined with a due estimate of the influence exercised by the principal human factors. All history should be studied in its relation to the present. The fine maxim of the old law of England from the lips of Sir Edward Coke is highly impressive: the right knowledge of anything depends on a knowledge of its history. And again Lord Bacon's dictum: a man relying upon his own experience only is like a man's private purse endeavouring to keep pace with the exchequer. As everyday experience teaches, there is no man so strong in his opinions as he who is entrenched in the self-confidence of ignorance. Mr. Garnier puts it concretely: "History teaches land reformers moderation." Such a one with hazy conceptions talking glibly of reforming the land laws might well pause to ask himself—better to consult Mr. Garnier's book—for a definition of that vaguest of will-of-the-wisp terms. Mr. Lecky, in a recent lecture, well observed in regard to a really intelligent study of history, Gather the dominant idea or characteristic of the particular period; what forces chiefly ruled it; what forces were rising into a dangerous ascendency; what forces were on the decline; what illusions, what exaggerations, what false hopes and unworthy influences chiefly prevailed. The business man's inclination would probably be to run swiftly over ancient history, to study history carefully and thoughtfully from the era, say, of printing, when, having cracked the hard shell of feudalism, soldiers and the *adscripti glebæ* emerged and expanded, and became as well, in England, husbandmen, merchants, and manufacturers.

Biography is a charming branch of history which agriculturally, as industrially, cannot be too much encouraged. To converse with the vivid and graphic biographer is indeed to keep good company. Shakespeare sums this matter in two pregnant lines:—

> "There is a history in all men's lives,
> Figuring the nature of the time deceased."

Before turning to consider Mr. Garnier's critics, I am tempted to cite Dr. Barrow: the reading of books, what is it but conversing with the wisest men of all ages and all countries, who thereby communicate to us their most deliberate thoughts, choicest notions, and best inventions, couched in good expression and digested in exact method? I ask myself, in which of these two particulars Mr. Garnier excels, and incline to think it is in expression. The criticisms of Mr. Garnier's book which I have read appear to afford, on the whole, the encouragement

that he desires. "Mr. Garnier holds out a hope of writing one day, for people who are not farmers, a book on the history of agriculture. Let him compose it in the same spirit as that in which he has written his *History of the English Landed Interest*, condescending to details which everybody is assumed to know, but of which most of us are ignorant, and he will instruct and occasionally amuse." The critique from which I have just cited is a little hard upon our author in two respects. "We do not," it says, "find Mr. Garnier makes adequate use of Arthur Young's *Tours of a Farmer in the North and East of England*;" now the period of which Mr. Garnier treats in his present work ends with the Revolution in 1689, and Arthur Young was not born until 1741; consequently, Mr. Russell Garnier's presentation of Mr. Arthur Young must chronologically be a pleasure to come. In the second place, objection is taken to the imaginary journey through Tudor England in the style of *Le Voyage du jeune Anacharsis en Grèce*. Three pages only are occupied by Mr. Garnier in this way; I cannot see that in his desire to be vivid and pictorial—in short, to please—he has greatly erred. I have always supposed that Barthélemy jumbled distinct periods in Greek history, and was blamed for that, and not at all on account of his style; anyway, Mr. Garnier has erred, if at all, in the society of a writer whose reputation tested by time has not failed to survive. And so let us take leave of the critiques of "the full volume now under review," in which volume, it is further accorded, "there is an abundance of good material."

Mr. Garnier takes his reader by the hand, and leads him pleasantly, rapidly, and by easy stages across the evolutionary centuries of English history down to the Revolution of 1689, both sides of the way being crowded with interesting illustrations and strewed with pregnant facts, concerning the history of English land. Herein lies the crux: the capacity of the historian may be tested by every reader for himself in answer to the test question, How far do the facts adduced bear upon the several issues? On the one hand, is anything wanting?—on the other, is there redundancy? The six stages, the breathing places, the several periods, are these: the Roman, the Anglo-Saxon, the Norman, the Middle Ages, the Tudor, and the Stuartine, with the close of which period the present volume ends. I propose in my few remaining observations to follow this convenient chronological order.

When in the face of the hostile Britons the standard-bearer of the 10th Roman legion, the Legio Victrix, leaped on shore, shouting to his comrades, "Men, follow me!" civilisation

typified by that standard came not to sojourn only, but after many vicissitudes to dwell, to wax, and to flourish pre-eminently on English land. Always politics—warlike fame meant political power at Rome, hence great Cæsar and his *Veni, vidi, vici.* The germ of every great thing is to be found in a preceding age,—for reasons to be explained when we consider the Norman Conquest—I do not care to inquire whether the Manorial system in England was infused directly by the Romans and filtered through Anglo-Saxon times, or otherwise; that system was more or less a feudal relation between the lord and his copyhold tenants, and be it always remembered that during all the Middle Ages the great body of the labouring classes were in a state of bondage. It is sufficient for me now to express my conviction that the Romans were the founders of British agriculture. Not so much because their agricultural settlers and road-making soldiers instructed the natives, but the Roman agricultural literature, and notably Palladius, was a shining light borne aloft during all the dark ages in England by the instructed hands of Latin-reading monastics. All early English and foreign agricultural writers founded on the Roman principles.

Mr. Garnier does ample justice to the Roman agricultural authors, and especially to Virgil—after Homer the greatest epic poet of antiquity—the tall dark man that looked like a farmer, who wedded scientific agriculture to melodious and immortal verse. It is most noteworthy that agricultural literature occupied a far higher position among the ancients than it has hitherto obtained in our day—that agriculture which, according to Xenophon, is the nursing mother of the arts.

The agriculture of the ancients should recall the name of Adam Dickson, a farming minister, and son of a farming minister, an associate of East Lothian farmers, who published in 1764 an admirable treatise on agriculture. This horny-handed pastor was killed by a fall from his horse and left a work posthumously published in 1788, the fruit of years of anxious study—*The Husbandry of the Ancients*—in which he traced the analogy between ancient and modern agriculture and supplied the connecting link. Mr. Garnier does not mention Adam Dickson, and yet he was an authority after Mr. Garnier's heart, and after my own heart—a practical experienced farmer, and, to boot, a ripe and industrious scholar.

The ancients yearned after principles. As the old law ot England well puts it, "Of everything the chief part is the principle." "Let us examine the *Georgics*," says Mr. Garnier —I find Georgics in his index, but, curiously, Virgil is not there.

Mr. Garnier continues: "Fallow, rotation, pickling, cleaning, weeds, bird-scaring are all advocated by Virgil with the skill and accuracy of a Cirencester College professor." Further, for example, Columella lays down a principle applicable in our day: the farm, he says, ought to be weaker than the farmer. Old Cato was great in this way—asked who was the best farmer (?), he answered a good grazier, and next (?) a middling grazier, and after (?) a bad grazier! I repeat further what old Cato said, as it may be a word in season: "There is much difficulty in speaking to the belly, because it has no ears."

Before turning to the Anglo-Saxon period I would observe that Mr. Garnier says, "Barnaby Googe's allusion, 1577, to a car armed with sharp sickles is the first mention of the mechanism of a reaping machine." I find, however, amongst my old notes from Pliny, and Adams' *Antiquities*, it is stated that "the Gauls reaped corn with a machine drawn by two horses; the heads were cut off to be gathered mechanically in a bag."

The Anglo-Saxon period is chiefly interesting as it presents to us Nature in her own vast crucible mixing together human elements to fuse them into an amalgam of nations destined with the fire of old Rome to form in the distant future a conquering, colonising, and imperial race, to occupy and to people the vacant or politically chaotic regions of the earth. But logically in the Anglo-Saxon period and, following Mr. Garnier, a word should be said about tithe. According to that eminent divine, Dr. Paley, tithes were originally voluntary, then compulsory, and subsequently applied by Papal dictation; Paley was in the last century so far in advance of his day as to say this ecclesiastical impost "born of savage times and barter should be converted into corn rents." Tithe in kind, now merely a subject of historical interest, was an impost barbarous in its inception, hateful in its imposition, and disastrous in its consequences. In the matter of tithe as in other things the Scotch agricultural history of the last century is an invaluable search light to be employed in the elucidation of English agricultural history. In our day there is still in regard to the Tithe rent-charge a crying want, and if we could possibly have a Government—

> "Where none were for a party,
> And all were for the State,"

that crying want would immediately be satisfied, provision should be made for the effectual, speedy, and equitable redemption of tithe.

One huge grand figure dominates the Norman period; the

strong light of contemporary history glitters upon the giant form of William the Conqueror, as he stands out against that dark and distant background, his good sword in one hand, his great Domesday Book in the other. We may rest assured that the Conqueror regarded the land—the fair face of all England—as a sheet of white paper on which to scribble the inflexible determinations of his iron will. This Domesday Book, this huge English rate book, allowing for times and circumstances, is unique amongst nations in the grandeur of its conception and the completeness of its execution; it is the basis of every English historical account of the Middle Ages. The contemporary writer in the Anglo-Saxon Chronicle relates how, in the year 1085, England was threatened with invasion, and how King William prepared for defence and raised the largest army England had ever seen; the soldiers were quartered upon the inhabitants, every man according to the land which he possessed. The King sent and caused to write down what property every inhabitant of all England possessed in land or in cattle, and how much money this was worth; so very straightly did he cause the survey to be made that there was not a single hyde, nor a yardland of ground, nor—says the annalist—it is shameful to say what he thought no shame to do —was there an oxen or cow or pig passed by, and that was not set down in the accounts, and all these writings were brought to him.

Turning to our author's subdivided period of the Middle Ages —1096–1485—Hallam, that most philosophic of historians, contemplates the fully extended period from A.D. 486 to the invention of printing about the year 1450—Mr. Garnier's first chapter of this period is headed the "Birth of the Land Laws;" perhaps this leading chapter in the history of English land might more properly be defined as the abnormal conception in the casuistical clerico-legal mind of the fictitious system of fines and recoveries, and all the complicated doctrines of leases and trusts—which together go to form that professional conveyancing which has been called the science and art of alienation.

> "Fee simple and a simple fee
> And all the fees in tail!"

The law, as was well said, subsequently became a great tangled forest in which lawyers prowled in order to devour their prey. And here, referring my reader to Mr. Garnier for full explanation, I sum in my own way all I have further to say on the English land laws—in the widest, not in the mere statutory sense of that term—"All lands in England," says Lord Bacon, "were the Conqueror's, and held of him except (1)

religious and church lands, (2) the lands of the men of Kent, which by composition were left to the owners as the Conqueror found them." We have it, then, that the feudal system in England was virtually established by the Conqueror, and before building further on this solid foundation let us endeavour to grasp the nature and duration of that system. The kingdom of England was divided into baronies, which for military purposes were granted on condition of the holder furnishing the King with men and money; in other words vassalage under the King, entailing endless subinfeudation—the tenure of land by military suit—or following—and service. This tenure was limited in England by Henry VII. in 1495, and abolished by statute in 1660. The feudal system was introduced into Scotland by Malcolm II. in 1008, and prevailed in France from about 486 until 1470.

To continue summing up—the history of real property in England is carried down to our day in the comprehensive words of Sir Hugh Cairns, then Solicitor-General. In introducing the Titles to Landed Estates Bill (1859), Sir Hugh said:—

"Looking back to the history of real property in this country, it may, by a broad line of demarcation, be divided in substance into two periods. Up to the time of the Commonwealth you were occupied in endeavouring by means of legal fictions to make the severe and simple forms of feudal law bend themselves to the advancing interests of commerce and to the wants of the people. Examples of this process may be found in the introduction of the fictitious system of fines and recoveries in this country, and in the various purposes which the complicated contrivance of uses and trusts was made to serve. Then when about the period of the Commonwealth you had succeeded by these fictitious means in getting rid, to a very considerable extent, of the severity of feudal tenures, a new period commenced, which has continued to the present time, during which the great effort has been to get rid in turn of those complex systems of legal fiction which had been useful up to that time in lessening the severity of feudal tenures.

"After 1660 there have been constant attempts to establish land registers and other means of simplifying transfer."

I cannot turn from the epoch-making period of Magna Charta without giving this spirited passage; it is from the pen of a great living authority on historical statute law:—

"Magna Charta was written in Latin, and contains a variety of provisions which lapse of time has rendered obsolete. But there remains one clause, the importance of which neither time nor change of custom can affect. It is the gospel of freedom to the English nation, and through them to the whole English-speaking world; it is law in the United States, and in every British colony; it is the birthright of every man who in any part of the world claims brotherhood with our race. It runs, shortly, as follows:—'No man shall be taken or imprisoned, or deprived of his freehold or liberties, or be outlawed, or exiled except by lawful judgment of his peers, or by the law of the land. We will sell to no man, will not deny or delay to any man, justice or right."

The reader should be further reminded of

> "That noble Chaucer, in those former times,
> Who first enriched our English with his rhymes."

He has left us perfect, ever fresh illustrations of his period (1328–1400) drawn to the life: the Canterbury Pilgrims—the knight, the yeoman, the Franklin, or Vavasour, the country gentleman of the period, the poor parson of a parish, the ploughman, and the miller. We have our forefathers and great granddames all before us sketched from life as they were in Chaucer's days.

The Tudor period is fully and graphically treated of by Mr. Garnier—the decline of feudalism, the growth of a middle class, the stampede then as now of the rural population towards the towns. He points out in his preface how under the sun there is nothing new—the three acres and a cow of our day is only a revival of the prevailing cry in the glorious reign of the great Eliza, four acres and a cottage. The forty-third year (1601) of this glorious reign is ever memorable because of the first poor law enactment. The dominating fact of this Tudor era is of course the momentum of the intellect-awakening Reformation: and recalls the contemporary Oxford College distich and toast—

> "Here's to our founder, Henricus Octavus,
> Who always took away more than he gave us."

Mr. Garnier has been advised by one of his critics to reprint in his projected work on agriculture Tusser's "Five Hundred Points of Husbandry;" to this I demur. I know Tusser's jingling rhymes well; they are useful no doubt, from a literary point of view, in giving historical colour, but I consider them, in an agricultural educational sense, practically valueless. A man of good education, alternately Church song-man and farmer, Tusser appears to have been a desultory character. Here is a contemporary, or nearly contemporary, epigram published 1608 —*ad Tusserum*—

> "Tusser, they tell me, when thou wert alive,
> Thou, teaching thrift, thyselfe could'st never thrive."

The towering intellect of Lord Bacon was in some measure directed towards English agriculture and the laws affecting land. With wonderful power of packing thought, he gives terse definitions such as could only flow from his all-comprehensive mind; amongst other things he defines copyhold, courts, tenure, user and property in land, how gotten or transferred. The

Englishman, says Lord Bacon, is the most master of his own valuation, and the least bitten in his purse of any nation in Europe. Lord Bacon, it is said, had a large collection of English agricultural works—here is a fine lesson for all agricultural writers—he one day had all these books piled up in his courtyard and burnt, for, said he, in all these books I find no *principles*; they can therefore be of no use to any man.

Shakespeare, whose all-seeing eye looked into the innermost parts of everything, understood farming thoroughly and had grand ideas of that most ancient art; in the *Taming of the Shrew* he makes Gremio say—

> "Then at my farm
> I have a hundred milch kine to the pail,
> Six score fat oxen standing in my stalls,
> And all things answerable to this portion."

There were indeed giants in those Tudor days.

The Stuartine period is satisfactorily treated by Mr. Garnier; amongst many other good things he gives a short history of highway legislation, and this reminds me of a *bon mot* of King Charles II., "who never said a foolish thing, nor ever did a wise one." He was so much taken with the dry soil and pleasant travelling in Norfolk that he said: "Norfolk should be cut into strips to make highways for the rest of England." A very curious and valuable little book published by the Surtees Society, Vol. XXXIII., appears to have escaped Mr. Garnier's attention—*Rural Economy in Yorkshire in* 1641, *being the Farming Book of Henry Best, of Elmswell, in the East Riding.* I am further induced to give an extract or two from the invaluable diary of Pepys, chiefly because it enables me to point a moral:—

"January 1, 1667–8.—Heare they did talk much of the present cheapness of corne, even to a miracle; so as their farmers can pay no rent, but do fling up their lands; and would pay in corne. But what I did observe to my Lord, and he liked well of it, our gentry are grown so ignorant in everything of good husbandry, that they know not how to bestow this corne; which, but did they understand a little trade, they would be able to joyne together and know what markets there are abroad, and send it thither, and thereby ease their tenants and be able to pay themselves.

"Again on January 31, 1667–8, Pepys writes: My visitor told me of the general want of money in the country, land sold for nothing; he spoke of the many pennyworths he knew in land and houses on them with good titles at sixteen years' purchase. I have a mind he said for one thing, a bishop's lease; they cannot stand (i.e. the church); it will fall into the King's hands, and I in possession shall have an advantage by it.

"And again on April 9, 1667.—Several do complain of abundance of land flung up by tenants out of their hands for want of ability to pay their rents—and by name that the Duke of Buckingham hath 6,000 pounds so flung up."

It is curious to note how Pepys had well grasped the germ

of the idea of agricultural co-operation. The moral I would especially point is this: periodic distresses in agriculture run throughout the centuries.

The fascination of the whole subject has led me to trespass at greater length than I had originally intended. Reader, if I have been fortunate enough in any degree to reawaken or to excite your interest, let me refer you for full satisfaction to Mr. Garnier's very useful and timely book. I beg him in his future undertaking to see that full justice is done to the important subject of "The Making of the Land," the agricultural conquest over the English wilderness. Mr. Garnier well says, "The expenditure of individual capital has long rendered the past irrevocable"—land, for example, not annually worth one shilling an acre converted by the expenditure of capital into farms worth for that quantity two pounds a year; he may tell of the Statute [1] Book teeming with Enclosure Acts. We have it on the high authority of Lord Thring.

"Some 4,000 Acts for the enclosure and regulation of commons crowd the Statute Book. The unemployed are always with us, and one remedy of our forefathers to relieve their distress was to enclose commons, and thus afford work to the labourer. We have now returned to the wisdom of our ancestors in this respect, and accept as good philosophy and good law the adage—

"'A sin it is in man or woman
To steal a goose from off a common.
But he doth sin without excuse
Who steals the common from the goose.'"

An enviable, a delightful vista now opens out before Mr. Garnier—pen and ink sketches of the agricultural giants of the eighteenth century: how he may revel in the charming literature of that day and cull gems of literary illustration, for example, amongst a thousand others, from Sir Roger de Coverley, from the Humphrey Clinker of my kinsman Smollett, from Arthur Young's absolute photographs, as he travelled about breaking down barriers by teaching respectively one district the best practice of another. Farmer George—Ralph Robinson—the King must not be forgotten, *et hoc genus omne*. The mass of all-important material is absolutely bewildering; my own danger would be, to use a French phrase, I should "grow too big for my boots!" The historian of the present time and not very remote past may well be stunned by the whirl of the vast machinery that weaves the web of history.

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[1] "Read the Statute Book; it is the best history of England." This was said to me by an old Justice when as a young man I took my seat on the bench. Mr. Froude says of the Statute Book, therein is buried the true history of the English nation.

Then we have the birth and growth of the great Agricultural Society, and all the other great births of that period, amongst others, the Tithe Commutation Act of 1836, which removed the chief impediment to and paved the way for the general advance of scientific agriculture; an Act that demonstrates the benefits wise and beneficent legislation may confer upon a languishing industry; Government drainage—another example of wisely directed legislative intervention—applied chemistry, railways, and steam. By the advent of the National Society the Woburn and Holkham sheep shearings were made national and expanded. It has been well said the Royal Agricultural Society has done for farming that which the great fairs of the Middle Ages did for commerce—they concentrated and diffused knowledge, brought customers and producers into contact, and helped to extinguish deep-rooted prejudices in the pleasurable excitement of social gatherings. Mr. Philip Pusey must be represented in the forefront of the advance, a delightful combination of scholarship and English practical good sense and energy. With him let Mr. Chandos Wren Hoskyns be represented, with in his hand the *History of Agriculture in Ancient, Mediæval and Modern Times*, a work small in bulk but grand in conception and execution, from the pen of the most eloquent agriculturist that our time has produced.

Mr. Garnier truly says in his preface, "This book is for the statesman as well as the agriculturist;" he goes on to say "The artificial enhancement of any nation's agricultural profits cannot be permanently beneficial; in such case the germs of failure are inherent." And, say I, any English statesman would under existing circumstances find it difficult in the long run to resist if clamorously asserted the *argumentum ad ventrem*."

After all that has been said and done in regard to progress, without a knowledge of history, it would be heartbreaking to contemplate agriculture in its immediate aspect. It is not marching, it is hardly marking time, perhaps stepping back; the flower of the rural population—men born and bred and trained on the farm—is being dispersed and driven in to further congest the labour markets of the already congested towns; the unseen but essential reserve of condition in the land is being largely overdrawn; the agricultural plant—in the sense of essential equipment and appliances of and upon the land—is being run out; no hopeful prospects open before us; the continuous tendency in the level of prices of nearly every agricultural commodity is to fall below the cost of production. On the high authority of Sir John Lawes we are just now told that "it is remarkable of how little value the experience of a very

long life engaged in scientific and practical agriculture is in suggesting remedies to meet the present state of affairs. Let us trust notwithstanding that statesmanship may, on a study of the English Statute Book and the precedents therein and otherwise, see the way to do that which is equitable and timely for the relief of now overburdened agriculture. It has been said—and surely this is a subject amongst others for anxious consideration—that the charges now imposed upon agricultural land by imperial and local taxation are unfair and excessive as compared with those falling upon personalty and other classes of property; that such charges are injurious to all concerned in the cultivation of the soil, fall with especial severity on the class of yeomen farmers, and by tending to increase the cost of production, and to overtax a struggling industry, are opposed to the interests of the community at large.

Let us hope that Mr. Garnier in the not distant future may be able to paint some such picture as that presented to us in the past by Mr. Justice Haliburton, who makes his ever-famous Sam Slick say of his paternal home: "I was bred and born on a farm—dear! says I—on one, too, where nothing was ever wasted and no time lost; where there was a place for everything, and everything was in its place; where peace and plenty reigned, and where there was a shot in the locker for the parson and another for the poor." It is sad to think that between the not far distant past and the immediate present how harsh is the contrast.

In taking leave of Mr. Garnier I cordially say, *Au revoir!*—I hope we shall meet again.

CATHCART.

Official Reports.

REPORT OF THE COUNCIL

TO THE

GENERAL MEETING OF GOVERNORS AND MEMBERS,

HELD IN THE

HALL OF THE ROYAL MEDICAL AND CHIRURGICAL SOCIETY,

At 20 *Hanover Square, W.*,

ON THURSDAY, DECEMBER 8, 1892,

The DUKE of WESTMINSTER, K.G. (President), in the Chair.

THE Council have to report that the List of Governors and Members has undergone the following changes during the half year which has elapsed since the Anniversary General Meeting on May 23 last:—3 new Governors and 298 Members have joined the Society, 4 have been re-instated as Members under Bye-law 12, and 7 Members have qualified as Governors; whilst the deaths of 6 Life Governors, 3 Annual Governors, 42 Life Members, and 65 Annual Members have been reported. A total of 4 Members have been struck off the books under Bye-Law 10, owing to absence of addresses; 34 under Bye-law 11, for arrears of subscriptions; and 141 have resigned.

2. The Council have to deplore the recent loss by death of their valued colleague, Mr. C. De L. Faunce De Laune, who joined the Society as a Governor in 1878. Elected a Member of the Council in 1885, Mr. De Laune has since that time rendered valuable services upon the Society's Chemical and Seeds and Plant Diseases Committees, and more recently upon the Journal and Education Committees also.

3. Amongst other Governors and Members who have died since the Anniversary Meeting on May 23 last, are the Duke of Sutherland, K.G.; the Duke of Marlborough; the Marquis of Drogheda; Earl Bathurst; the Earl of Essex (a Foundation Life Governor); the Earl of Harewood; Viscount Sherbrooke; Lord Winmarleigh (a Foundation Life Governor); the Hon. J. J. Carnegie (a Member since 1844); the Hon. J. C. Dundas; Sir Thomas Evans, Bart.; Sir W. B. Riddell, Bart.; Col. Sir H. F. Custance, K.C.B.; Mr. Barclay Field; Mr. H. W. Freeland; Mr. T. Tertius Paget; Mr. J. E. Knollys and Mr. Wm. Parker (Members since 1843); and Mr. George Taylor (a Member since 1841).

4. The Council have elected, as an Honorary Member of the Society, Professor M. Maercker, of the Versuchs-Station, Halle, Germany, in recognition of his distinguished services to European Agriculture.

5. These and other changes bring the total number of Governors and Members now on the Register to 11,059, divided as follows :

25	Foundation Life Governors (Members elected before the granting of the Charter on March 26, 1840) ;
72	Governors paying an annual subscription of 5*l.* ;
84	Life Governors who have compounded for their annual subscriptions ;
21	Honorary Members ;
7,084	Members paying an annual subscription of 1*l.* ;
17	Members who, having paid annual subscriptions for 50 Years, have become Life Members ;
3,676	Life Members who have compounded for their annual subscriptions ;
80	Life Members by Examination ;
11,059	Total number of Governors and Members ;

or a net increase of 86 Members since the same period last year.

6. The Society's Annual Country Meeting held last June in the beautiful Castle Park at Warwick proved highly successful. Fine weather prevailed throughout the week with the exception of Thursday, the first shilling day, which unfortunately was exceedingly wet. The local authorities of Warwick and Leamington heartily co-operated with the Society in endeavours to make the Meeting a success, and the result was a very representative exhibition in the Midlands of our national breeds of live stock, and of the implements and appliances of English husbandry. The total receipts were in round figures 800*l.* less than at the previous Meeting at Doncaster in 1891, mainly arising from the shrinkage in the takings at the turnstiles, and in one or two minor items the expenses were greater ; but, on the other hand, there were substantial reductions in the cost of building the showyard (owing partly to the number of entries of horses being considerably smaller), in advertising, and in management generally, whilst the amount spent in prizes was 1,000*l.* less than in 1891. The financial result, therefore, is an excess of receipts over expenditure amounting to 2,055*l.*, as against 100*l.* last year.]

7. The Council have to report with great regret that since the Warwick Meeting, Sir Jacob Wilson has expressed his desire to be relieved of the duties in connection with the honorary direction of the Society's Country Meetings, which he has fulfilled with so much advantage to the Society during the last eighteen years. Acting upon what they felt would be the universal wish of the general body of Members, the Council have expressed to Sir Jacob Wilson by a special resolution their high appreciation of the conspicuous services rendered by him during his period of office, and they have also

elected Sir Jacob a Life Governor of the Society, and requested his acceptance as from the Society of a piece of plate of the value of 100 guineas, in grateful recognition of his invaluable services.

8. The Council have decided that the Chester Meeting shall open on Monday, June 19, 1893, and close on the following Friday evening. The Implement Yard and the Dairy will be open to Members of the Society and the public on the previous Saturday, June 17. The last day for making entries in the Implement Department will be Saturday, April 1; but post-entries of agricultural implements only will be received up to Saturday, April 8. For Stock, Poultry, and Produce the entries will close on Monday, May 1, with post-entries at double fees up to Friday, May 12.

9. The Council have already reported their decision to offer in connection with the Chester Meeting prizes amounting in all to 100*l.* for Self-Binding Harvesters, using other binding material than wire. Two prizes of 20*l.* and 10*l.* will also be offered for Sheep-Shearing Machines, worked by power and by hand or foot respectively.

10. The prize-sheet for Stock, Poultry, and Produce has now been definitely settled, and will be issued immediately. The prizes offered (exclusive of Champion Prizes and Medals offered by various Breed Societies) amount in all to 6,227*l.*, of which 1,428*l.* is provided by the Chester Local Committee.

11. The special prizes offered by the Chester Local Committee for Live Stock include five classes for Hunter Mares and Geldings, two for Hackney Mares and Geldings, two for Welsh Mountain Ponies, two for Harness Horses, two for Clydesdales, and three for Agricultural Geldings; one for Welsh cattle and two Champion Cups for the best male and the best female of that breed; one class each for Kerry and Dexter Kerry Heifers; five classes for Dairy Cows and Heifers; one class for pens of Shropshire shearling Rams; and two for Welsh Mountain Sheep. The Local Committee also offer the very handsome amount of 540*l.* for prizes for Cheshire Cheese, including a Champion prize of 100*l.* and rewards to the makers of the first prize cheese in each of eight classes; and they have, moreover, provided the funds for an extra Butter-making Competition amongst dairymaids and others, who have received instruction at the Dairy schools in Cheshire and North Wales.

12. The classes for Horses offered by the Society itself will include Hunters, Cleveland Bays, Coach Horses, Hackneys, Ponies, Shires, Clydesdales, and Suffolks. In the Cattle Classes, prizes will be offered by the Society for the Shorthorn, Hereford, Devon, Sussex, Welsh, Red Polled, Aberdeen Angus, Galloway, Ayrshire, Jersey, Guernsey, Kerry, and Dexter Kerry breeds, as well as for Dairy Cows yielding the largest quantity of butter by practical test of the churn. The classes for Sheep will include Leicesters, Cotswolds, Lincolns, Oxford Downs, Shropshires, Southdowns, Hampshire

Downs, Suffolks, Wensleydales, Border Leicesters, Somerset and Dorset Horned, Kentish or Romney Marsh, Cheviots, Black-Faced Mountain, Lonks, Herdwicks and Welsh Mountain. Those for Pigs will include the Large White, Middle White, Small White, Berkshire, Black, and Tamworth breeds. Prizes will also be given for useful descriptions of Poultry, including Table Chickens and Ducklings; for Cheeses of 1892 and 1893 make, and Cream Cheese; for Fresh and Salt Butter; for Cider and Perry; and for Jams and Preserved Fruits and Vegetables made in 1892. The British Beekeepers' Association will continue their Prizes for Hives, Honey, and Bee Appliances.

13. Butter-making Competitions will be continued at Chester in four classes, together with a Champion class for the Society's Silver Medal and a prize of 5*l*. There will also be competitions of Shoeing Smiths practising in the district of the Meeting, comprising Cheshire, Lancashire, and North Wales. The competitions will be in two classes, viz. for Hunters and Agricultural Horses, and five Prizes will be offered in each. The Worshipful Company of Farriers have generously offered, as before, to provide the First Prize in each of these two classes, and to bestow the Freedom of their Guild upon the two first-prize winners. The Registration Committee of the Farriers' Company will also admit all the winners of prizes in these Competitions to the official register of Farriers or Shoeing Smiths free of charge, and will give facilities for the examination of competitors who desire to be admitted to such Register.

14. Memorials have been received from the Corporations of Cambridge and St. Albans inviting the Society to hold its Country Meeting of 1894 in their respective towns. The customary Committee of Inspection has been appointed to report on the sites and other accommodation offered by each locality, and a final decision as to the place of the Country Meeting of 1894 will be made by the Council in February next. The Council have decided to offer Prizes for Oil Engines in connection with the 1894 Meeting.

15. Owing to the large increase in the number of Members, and the general extension in late years of the Society's operations, it has become necessary to relieve the Secretary from the extra work caused by the quarterly publication of the Journal. The Secretary has therefore been released from his editorial responsibilities in connection with the Journal, and the editorship thereof has been intrusted to Dr. William Fream at a remuneration of 500*l*. per annum.

16. The Council regret to report that, in consequence of ill-health, Miss Eleanor A. Ormerod felt compelled in July last to relinquish her post of Honorary Consulting Entomologist, which she has held with so much advantage to the Society since the year 1882. Miss Ormerod kindly undertook to reply to pressing inquiries from Members during the autumn recess, and furnished a large amount

of serviceable information to Members and others during that time. After a careful consideration of the new arrangements necessary in consequence of Miss Ormerod's resignation, the Council have decided to create a department of Zoology as applied to agriculture, and to place this department in charge of an officer, who will devote himself to the study of the life histories and habits of insects, birds, and other animals useful or injurious to agriculture, with the object of supplying practical and reliable information thereon to Members of the Society, under conditions to be arranged.

17. The Council again refer with satisfaction to the success of the recent efforts of the Board of Agriculture in dealing with contagious pleuro-pneumonia. The outbreaks of this disease have annually decreased in number from 618 in 1887 to 60 in 1891, and to 35 according to the last published returns of the present year. In view, therefore, of the late outbreak of pleuro-pneumonia amongst store cattle imported into Scotland from Canada, the Council felt grave apprehension lest the losses and restrictions suffered by British Agriculturists in the endeavour to stamp out the disease should prove futile, owing to continued free importation of animals from an infected country. In concert with other important agricultural bodies, they therefore attended as a deputation to the President of the Board of Agriculture on November 4, for the purpose of urging the Board to put at once into force the Act of 1878 by rescinding the special regulations under which Canadian cattle were exempted from slaughter at the port of landing, and in this object they were successful.

18. In reference to the outbreak of Foot and Mouth Disease, which suddenly made its appearance in the London Cattle Market early in February, and at one time threatened to become widely spread throughout the country, it must be a source of great satisfaction to agriculturists generally to find that the disease was practically eradicated within six months of its introduction. During the period mentioned it appeared in fifteen counties in Great Britain. Ninety-two outbreaks were reported, 4,900 animals were attacked, 568 were killed, and 151 died; besides this many hundreds were slaughtered by the Board of Agriculture to check the extension of the disease. At the close of this year it may be said that the country has never been so free from contagious diseases of animals as at present. Pleuro-pneumonia is practically eradicated, not only in Great Britain but in Ireland. Foot and Mouth Disease has ceased to exist, and Swine Fever has decreased very considerably, the result being that every part of the country is now entirely free from those restrictions which for many years have been so vexatious to the owners of cattle and sheep.

19. At the Royal Veterinary College a number of important researches have been carried out under the Society's grant in aid of the study of Comparative Pathology and Bacteriology. These include swine erysipelas, actinomycosis, glanders, tuberculosis, and yew-

poisoning. In reference to tuberculosis, the substance called "tuberculin," which is extracted from cultures of the bacillus of the disease, has been used with the most gratifying results as an aid to diagnosis. Other subjects of investigation have been inflammation of the lungs in horses and the occurrence of cancerous and other tumours in the different domesticated species. Details of the results of the investigations made will appear in due course in the Society's Journal.

20. Investigations into the communicable nature of Foot-rot in Sheep, undertaken for the Society by the Royal Veterinary College, have conclusively demonstrated the contagious character of this affection. Professor Brown's report on these investigations has been reprinted from the Journal in pamphlet form, and a leaflet giving practical directions for dealing with the disease has been extensively circulated.

21. In the Chemical Department, the number of analyses made on behalf of members during the past seven months has been 547. A decided improvement has been noticeable in the quality of linseed cakes sent for examination, and the instances in which guarantees of "purity" have been willingly given to purchasers have been much more numerous than previously. In almost all such cases the guarantee has been satisfied.

22. The usual Field Experiments have been continued at the Woburn Farm, and the experiments have been visited by several parties of agricultural students and rural schoolmasters. The Council will be happy at any time to make arrangements for the Resident Superintendent to take any similar parties over the Farm, and to explain to them the experiments in progress. Feeding experiments, both with bullocks and with sheep, will be carried on throughout the winter. An extensive series of experiments on the efficacy of the *bouillie bordelaise* treatment of potatoes in preventing and checking disease has just been completed at the Woburn Farm, and the report will appear in the forthcoming number of the Society's Journal. See page 771.

23. The three Local Agricultural Societies, viz., the Norfolk Chamber of Agriculture, the Essex Agricultural Society, and the Royal Manchester, Liverpool, and North Lancashire Agricultural Society—which are associated with the Royal Agricultural Society for the carrying out of Field Experiments—have continued their work as in former years.

24. The experiments which were undertaken by the Society at the request of the Board of Agriculture upon the prevention and cure of "Potato disease" have been again carried out in six different parts of England and Wales. The results will be published in this number of the Journal. See page 761.

25. The quality of the seeds examined by the Consulting Botanist during the past year was satisfactory—the germination and purity retained the high position reached in the previous year. Less

dodder was found in the clovers, but some clover samples contained large quantities of the seeds of weeds, especially of sorrel. The diseases of the cereal crops have demanded more attention, and the injuries produced by parasitic fungi on the crops of the field and the garden brought under notice have been more numerous than in any previous year.

26. As a result of the Examination for the Society's Senior Prizes and Certificates, which took place on May 10 to 14 last, ten of the twenty candidates satisfied the examiners; and the following competitors, placed in order of merit, gained First-class Certificates, and thus became Life Members of the Society; the first four being entitled, in addition, to the prizes stated below:—

1. John Campbell, The University, Edinburgh. *First Prize of* 25*l.*
2. Thomas Askew Coward, The University, Edinburgh. *Second Prize of* 15*l.*
3. John Jenkinson, Royal Agricultural College, Cirencester. *Third Prize of* 10*l.*
4. Walter E. Coates White, The Agricultural College, Aspatria, Carlisle. *Fourth Prize of* 5*l.*
5. Percy Hedworth Foulkes, The University, Edinburgh.
6. Joseph Bisset, 22 Orford Street, Chelsea, S.W.
7. Edwin Alexander Fulton, The University, Edinburgh.
8. Arthur Noël Joseph Whitley, Royal Agricultural College, Cirencester.

The following candidates, having passed in Agriculture and in three of the four other compulsory subjects, are entitled to Second-class Certificates:—

9. George Bowman, Upleatham R.S.O., Yorkshire.
10. Martin Hammond Ward, The Agricultural College, Aspatria, Carlisle.

27. The Annual Examination for the Society's ten Junior Scholarships, of 20*l.* each, took place on November 8 and 9, when forty-three candidates competed. Of these twenty-four passed in all four subjects (Agriculture, Chemistry, Mechanics, and Land Surveying), and obtained the number of marks necessary to qualify them for the Society's Scholarships and Certificates, in the event of their complying, during the forthcoming year, with the conditions of the Examination. Three other boys passed in each of the four subjects, but, not having obtained the minimum aggregate of marks, are ineligible for Certificates. Of the sixteen other unsuccessful candidates, four failed in one subject, five in two subjects, six in three subjects, and one in all four subjects. There were seven failures in Agriculture, nine in Chemistry, ten in Mechanics, and ten in Land Surveying. Of the twenty-four successful candidates, the first ten in the following list will receive Scholarships upon complying with the Society's regulations, and the remainder will receive Certificates:—

1. Norman Endacott, Ashburton Grammar School.
2. Richard Smith Willows, Sedgebrook School, nr. Grantham
3. Arthur Harry Edgar Norris, Northampton Grammar Sch.
4. Arthur Shaw, Aspatria Agricultural College.
5. Albert Edward Stone, Pine House School, Wincanton.
6. William D. McCreath, Maybole Public School, N.B.
7. George Dykes Porteous, Maybole Public School, N.B.
8. Sydney Francis Ashby, Aspatria Agricultural College.
9. Richard Porteous, Maybole Public School, N.B.
10. Alexander John Gray, Aspatria Agricultural College.
11. William Burkitt, North East Co. School, Barnard Castle.
12. Eric Mortimer, Ashburton Grammar School.
13. William Maddicott, Aspatria Agricultural College.
14. { Harry Fowell Oldman, Aspatria Agricultural College.
{ George Skinner, Ashburton Grammar School.
16. Harry Overy, Swanley Horticultural College.
17. George Main Wilson, Aspatria Agricultural College.
18. { Thomas Charles Harvey, Ashburton Grammar School.
{ Edward Sawdye, Ashburton Grammar School.
20. Archibald Macqueen, Coedydinas, Welshpool (*Unattached*).
21. Hubert Clifford Sheringham, Aspatria Agricultural Col.
22. John Joseph Tucker, Ashburton Grammar School.
23. Lancelot Townsend Wheeley, Surrey County School.
24. Daniel Clyne, Gersa Public School, Caithness, N.B.

28. Three editions of the Society's Text-Book, *Elements of Agriculture*, prepared by Dr. Fream under the direction of the Education Committee, have now been exhausted, and a fourth edition has just been published at the price of 3*s.* 6*d.* The new edition contains thirty-six more pages than the others, and includes 256 original illustrations from wood engravings, as compared with 200 process and other blocks in the previous editions. The Author has carefully revised the text, and has made additions to various parts of the work, whilst at the same time he has had in view the necessity of keeping the volume within moderate dimensions.

29. As the date (May 22) appointed by the Charter for the Anniversary General Meeting of the Society falls next year upon Whit Monday, and there is no provision in the Charter for the case of a public holiday, the Council suggest that a *pro formâ* meeting should be held on May 22, 1893, in order to comply with Clause 6 of the Charter, and that such meeting should be immediately adjourned for a week. If this suggestion be approved, the next General Meeting of Governors and Members will take place on Monday, May 29, 1893.

By Order of the Council,

ERNEST CLARKE,
Secretary

December 7, 1892.

QUARTERLY REPORT OF THE CHEMICAL COMMITTEE,

December, 1892.

1. Mr. J. A. Fowler, of Inverbroom House, by Garve, Ross-shire, N.B., sent on February 10, 1892, two samples of Linseed-cake, marked respectively A and B, for analysis, upon which the following Reports were returned :—

A — February 17, 1892.

Moisture	12·35	100·00
Oil	6·83	
[1] Albuminous compounds (flesh-forming matters)	30·10	
Mucilage, sugar, and digestible fibre	32·29	
Woody fibre (cellulose)	9·33	
[2] Mineral matter (ash)	9·10	
[1] containing nitrogen	4·81	
[2] including sand	3·75	

About the most impure cake I have ever analysed.

B — February 17, 1892.

Moisture	11·05	100·00
Oil	8·06	
[1] Albuminous compounds (flesh-forming matters)	30·37	
Mucilage, sugar, and digestible fibre	36·87	
Woody fibre (cellulose)	8·00	
[2] Mineral matter (ash)	5·65	
[1] containing nitrogen	4·86	
[2] including sand	·60	

Not at all pure, nor of good quality.

Both these cakes had been purchased from Mr. Alexander Mactavish, Agricultural and Seed Merchant, 14 and 16 Castle Street, Inverness, and the order having been a verbal one, and the invoice not stating what kind of cake the deliveries consisted of, Mr. Fowler wrote to the vendor to inquire. He received the following reply :—

"J. A. Fowler, Esq., of Inverbroom. Inverness: February 24, 1892.

"Dear Sir,—I am in receipt of yours of yesterday's date, for which I am obliged, and, in reply, the cakes sent you are made from pure Linseed, and for your requirements, booked now, delivery March-April, I would accept same price as last lot, viz. :—

* * * Linseed-cake		9*l.* 10*s.*
† †	"	10*l.* 10*s.*

Net cash. Your orders would oblige, and have my best attention.—Yours truly,

"Alexander Mactavish."

The cake marked A was the * * * Linseed-cake, and that marked B was the † † Linseed-cake. Subsequently, invoices describing the cakes as such were sent.

In order that there should be no mistake, Mr. Fowler took two more samples from the same deliveries and sent them for analysis. The results of these further analyses are appended, and it will be noticed that they do not differ materially from the ones made in the first instance.

A	July 8, 1892.	
Moisture	11·00	100·00
Oil	7·09	
[1] Albuminous compounds (flesh-forming matters)	27·69	
Mucilage, sugar, and digestible fibre	36·56	
Woody fibre (cellulose)	8·48	
[2] Mineral matter (ash)	9·18	
[1] containing nitrogen	4·43	
[2] including sand	3·75	

A cake loaded with impurities, and which ought by no means to be called Linseed-cake.

B	July 8, 1892.	
Moisture	11·06	100·00
Oil	8·79	
[1] Albuminous compounds (flesh-forming matters)	31·56	
Mucilage, sugar, and digestible fibre	35·97	
Woody fibre (cellulose)	7·10	
[2] Mineral matter (ash)	5·52	
[1] containing nitrogen	5·05	
[2] including sand	·54	

This cake has a good deal of foreign weed-seeds and starchy materials.

The cake A was, as before, * * * cake, and the portion sent for analysis bore part of the brand on it. The cake B was † † cake.

The vendor, on being asked to give the names of the makers of the cakes, or to state the guarantee upon which they had been purchased by him, and on the strength of which he had sold them to Mr. Fowler as "pure," declined to give the information, but pressed for payment of the account, together with interest.

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2. Mr. C. E. Galbraith, of Ayton Castle, Ayton, N.B., sent on September 17, a sample of Linseed-cake for analysis, on which the following Report was given:—

	September 24, 1892.	
Moisture	12·75	100·00
Oil	13·56	
[1] Albuminous compounds (flesh-forming matters)	26·59	
Mucilage, sugar, and digestible fibre	31·02	
Woody fibre (cellulose)	10·23	
[2] Mineral matter (ash)	5·85	
[1] containing nitrogen	4·25	
[2] including sand	·60	

This is an impure cake, containing a considerable admixture of rape.

Four tons of this cake had been purchased from Messrs. George Meek & Son, 19 High Street, Hull, the price being 8*l*. 15*s*. per ton carriage paid to Ayton Station. The invoice read as follows:—"4 Tons 1115=95% Linseed-cakes, at 8*l*. 15*s*. per ton, 35*l*."

Before purchasing the cake, Mr. Galbraith had received a letter from Messrs. George Meek & Son enclosing the accompanying certificate of analysis:—

Hull: August 9, 1892.

Copy of Analysis of Sample of G.M. 95% *Linseed-cakes.*

Moisture	11·68	100·00
Oil	16·40	
[1] Albuminous compounds	28·35	
Mucilage	28·67	
Woody fibre	6·82	
Ash	8·08	
[1] nitrogen	4·48	
equal to ammonia	5·44	

"This is 95% Pure Linseed-cake—remarkably rich in Oil."

(Signed) M. D. Penney, F.C.S., &c.

Upon Mr. Galbraith complaining of the quality, an allowance of 10*s*. per ton was made by the vendors.

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3. Mr. Charles Neale, of Kneeton, Nottingham, sent on July 1, a sample of Dissolved Bones, which he said had been sold to him as *pure*, the price being 6*l*. per ton.

Upon analysis, the sample gave the following result:—

July 12, 1892.

Moisture	16·90	100·00
[1] Organic matter and water of combination	20·32	
Monobasic phosphate of lime	6·86	
Equal to tribasic phosphate of lime (bone phosphate) rendered soluble by acid	(10·75)	
Insoluble phosphates	19·77	
Sulphate of lime, alkaline salts, &c.	34·06	
Insoluble silicious matter	2·09	
[1] containing nitrogen	1·12	
equal to ammonia	1·36	

This is not pure dissolved bones, but made up with boiled bones. The price is decidedly high.

. . . .

Two tons had been purchased in June, from Messrs. Wilmot & Allison, Newton-on-Trent, Newark, who were stated to be the manufacturers.

After receiving the analysis Mr. Neale wrote:—

"I have written to them to tell them about the analysis, but received no reply.

"When I ordered it, I told them that I should most likely have it

analysed, and Mr. Wilmot said if it was not pure dissolved bones he would give it me for nothing."

Up to December 1 Mr. Neale has received no reply, nor has he paid for the manure.

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4. Mr. J. Hankinson, of Barnsley Hall, Bromsgrove, sent on October 8, a sample of manure which he described as "Boiled Bones," subsequently stating that it was ordered as "Boiled Bones, and to be free from Blood." The price was 5*l.* per ton, less 10*s.* per ton for cash, delivered. Four tons had been purchased from the manufacturers.

Mr. Hankinson, fancying that it was mixed with dried blood, sent a sample for analysis.

Dr. Voelcker noticed that the manure was partially dissolved, and thought that possibly the manure had been intended for *dissolved* bones and not *boiled* bones. He accordingly gave the following Report:—

October 20, 1892.

Moisture	13·88	
[1] Organic matter and water of combination	40·46	
Monobasic phosphate of lime	5·30	
Equal to tribasic phosphate of lime (bone phosphate) rendered soluble by acid	(8·31)	100·00
Insoluble phosphates	22·37	
Sulphate of lime, alkaline salts, &c.	17·00	
Insoluble silicious matter	·99	
[1] containing nitrogen	3·49	
equal to ammonia	4·24	

This is not a genuine sample of dissolved bones, but is made up with dried blood and other nitrogenous matter. The nitrogen accordingly is *not* derived purely from bone, as it ought to be. The sample is coarse and badly prepared, containing comparatively little fully dissolved bones.

Mr. Hankinson confirmed what he had said, that he had ordered "Boiled Bones," but added that when he told the vendor that he had had the bones analysed, and that dried blood had been mixed with them, the vendor said that if he was not satisfied he could return them and he (the vendor) would pay the carriage back.

Mr. Hankinson was unwilling to give the manufacturer's name.

Basic Slag.—The Committee think it desirable to draw the attention of intending purchasers of Basic Slag to the variable qualities of this material which are put upon the market. They advise that not only should a guarantee both of quality and fineness be obtained by the purchaser, but also that samples should be checked by analysis.

In a case which recently occurred, a guarantee of from 37 to 42

per cent. of Phosphate of Lime had been given, the Slag to be of from 85 to 90 per cent. "fineness."

On analysis, however, the sample was found to contain only $31\frac{1}{2}$ per cent. of Phosphate of Lime, and to be of only 64 per cent. "fineness."

Upon the purchaser complaining, the answer of the agent from whom the Slag had been purchased was, "As your first order was for a small quantity, perhaps they did not think it would be likely to be tested."

A sample of another lot, forwarded subsequently, came up to the guaranteed description.

EMLYN,
Chairman.

December 6, 1892.

REPORT OF THE EDUCATION COMMITTEE

On the Results of the Junior Examination of November, 1892.

THE Committee have to report that the Examination for the Society's ten Junior Scholarships of 20*l.* each, for boys between the ages of 14 and 18, took place on November 8 and 9, 1892. There were forty candidates from thirteen schools, and three candidates unattached, making in all forty-three entries.

2. Of the forty-three competitors, twenty-four have passed in all four subjects (Agriculture, Chemistry, Mechanics, and Land Surveying) and have obtained the number of marks necessary to qualify them for the Society's Scholarships and Certificates. These will, in accordance with the regulations, be retained until the winners of the Scholarships shall have spent the ensuing year at school or college, or with a practical agriculturist upon a farm. Three candidates (two from the Ashburton Grammar School, and one from the Surrey County School) passed in all four subjects, but failed to obtain the minimum total marks necessary to qualify for Certificates. Of the sixteen other unsuccessful competitors, four failed in one subject, five in two subjects, six in three subjects, and one in all four subjects. There were seven failures in Agriculture, nine in Chemistry, ten in Mechanics, and ten in Land Surveying.

3. The names of the successful candidates, with the number of marks gained by each, are given in the Table on the next page.

4. The Examiner in Agriculture (Mr. Primrose McConnell, B.Sc.) reports that "eight of the candidates, or about 18 per cent., have failed to obtain the pass number of 150 out of 400 marks; but this is a satisfactory result when it is considered that the candidates

cannot 'get up' the subject wholly from any book, but must know something practically of a wide range of farm work. All the questions were well answered by some or other of the competitors, showing a wonderfully good acquaintance with the actual work of farming. On the whole, the results are quite up to, if not better than, some of those of former years."

5. The Examiner in Elementary Chemistry (Dr. J. Augustus Voelcker, B.A., B.Sc.) reports that "out of the 43 papers sent in, nine failed to obtain the requisite number of marks. Though the failures were less than last year, the papers did not, as a whole, show any improvement in general. One paper alone approached to any-

No. in order of merit	Candidate	Age	School or College	Agriculture, 400; pass, 150	Chemistry, 200; pass, 75	Mechanics, 200; pass, 75	Land Surveying, 100; pass, 40	Total, 900; pass, 450
1	Endacott, N. . .	16	Ashburton Grammar School .	335	148	190	62	735
2	Willows, R. S. .	17	Sedgebrook, Grantham . . .	321	164	160	53	698
3	Norris, A. H. E. .	17	Northampton Grammar School .	260	112	190	78	640
4	Shaw, A. . .	17	Aspatria Agricultural College .	303	91	138	70	602
5	Stone, A. E. . .	16	Wincanton (Pine House) . .	264	100	153	74	591
6	McCreath, W. D. .	16	Maybole Public School, N.B. .	272	130	125	62	589
7	Porteous, G. D. .	17	Maybole Public School, N.B. .	278	141	108	60	587
8	Ashby, S. F. . .	17	Aspatria Agricultural College .	268	128	137	50	583
9	Porteous, R. . .	15	Maybole Public School, N.B. .	253	129	133	60	575
10	Gray, A. J. . .	16	Aspatria Agricultural College .	209	132	163	68	572
11	Burkitt, W. . .	16	Barnard Castle (N.E. Co. School) .	283	137	95	54	569
12	Mortimer, E. . .	15	Ashburton Grammar School .	234	111	162	60	567
13	Maddicott, W. .	17	Aspatria Agricultural College .	263	113	143	40	559
14	Oldman, H. F. .	15	Aspatria Agricultural College .	285	103	88	46	522
	Skinner, G. . .	14	Ashburton Grammar School .	214	100	161	47	522
16	Overy, H. . .	17	Swanley Horticultural College .	218	114	125	64	521
17	Wilson, G. M. .	17	Aspatria Agricultural College .	249	100	118	42	509
18	Harvey, T. C. .	16	Ashburton Grammar School .	225	99	118	58	500
	Sawdye, E. . .	15	Ashburton Grammar School .	273	102	83	42	500
20	Macqueen, A. .	17	*Unattached*	215	81	140	57	493
21	Sheringham, H. C.	16	Aspatria Agricultural College .	254	85	108	42	489
22	Tucker, J. J. . .	16	Ashburton Grammar School .	203	99	126	44	472
23	Wheeley, L. T. .	16	Surrey County School . . .	200	92	121	44	457
24	Clyne, D. . .	17	Gersa Public School, N.B. . .	230	90	87	45	452

thing like excellence. The elementary questions on the physical properties of water and on the difference between organic and inorganic bodies were, as a rule, very imperfectly answered."

6. The Examiner in Mechanics and Natural Philosophy, and in Mensuration and Land Surveying (the Rev. Professor Twisden, M.A.), reports that "the results of the Examination in Mechanics are, on the whole, more satisfactory than those of the Examination in Mensuration. I am inclined to think that more attention had been paid to Mechanics than to Mensuration. Many of the examinees answered several of the questions (see page 760) well or fairly well: *e.g.*, Questions 1, 3, 5, 7, 8, 10. The weak point was that only a few sent up good answers to Question 2 or 9, and only two sent up good answers to both questions."

7. "The marks in Mensuration and Land Surveying," reports Professor Twisden, "are not high. This is partly due to the examinees knowing little or nothing about the Vernier (Question 5). However, one candidate gave a good, and another a fairly good answer to this question. Questions 1 and 6 were very generally answered, and it may be mentioned that the results in Question 1 were often very accurate, considering the scale employed : *e.g.*, the calculated values are BC=413·8ft., B=40° 55′, C=85° 5′. It was not at all unusual for the constructions to give B=41°, C=85°, and BC values ranging from 412 to 416 ft. The second part of Question 2 was answered correctly only once. In Question 4 a good many found that the length of the scale is 6 inches, but, excepting in the case of one school, few knew how to draw a scale."

8. The results of the Examination upon the whole show a decided improvement even over those of 1891, which were above the average of the previous seven years. In several of the schools the teaching appears very efficient, as shown by the proportion of their candidates successful in passing the Examination.

MORETON,
Chairman.

December 6, 1892.

EXAMINATION IN AGRICULTURE.

MAXIMUM NUMBER OF MARKS, 400. PASS NUMBER, 150.

Tuesday, November 8, 1892.

(*Three hours allowed.*)

1. Describe the part earthworms have played in the formation of British soils.
2. What is the usual draught of a plough (measured in pounds) for every inch in depth of the furrow in light, medium, and heavy soils ?
3. What is the cost per acre of the following kinds of work in your neighbourhood ?—Ploughing, sowing, harrowing, rolling, wheat-hoeing, singling out roots, hay-making, harvesting, topping and tailing swedes, and potato-raising.
4. Explain the process of wet-warping of land.
5. In selecting, harvesting, and storing grain for seed, what points must be attended to ?
6. State what you know concerning the disease known as "rust" on wheat.
7. Describe the kinds of soils usually found on the Chalk-rock formation.
8. Describe the cultivation of vetches or tares, and the several ways in which the crop may be utilised.
9. Describe the action of a cream-separator, and state wherein "separated milk" differs from ordinary skim milk.

EXAMINATION IN ELEMENTARY CHEMISTRY.

MAXIMUM NUMBER OF MARKS, 200. PASS NUMBER, 75.

Tuesday, November 8, 1892.

(*Three hours allowed.*)

1. What broad distinctions may be drawn between *Organic* and *Inorganic* bodies? Show that the distinctions are not absolute ones.

2. Give the principal *physical* properties of water. At what temperature has it its greatest density, and how does this affect the freezing of water?

3. What compounds does Sulphur form with Iron? How are these obtained, and what are their principal uses?

4. Whence is Sulphate of Ammonia derived, and why is it used in agriculture?

5. What are the main differences, both as to kind and quantity, between the "salts" that occur in *sea water*, and those in *well water*?

6. Why should Bones be useful in agriculture? How can their action be rendered more speedy by chemical treatment, and what are the chemical changes produced?

7. Define in chemical language the following: *spirits of salt; spirits of wine; hartshorn; pearl-ash; sugar of lead; lunar caustic.*

EXAMINATION IN MENSURATION AND LAND SURVEYING.

MAXIMUM NUMBER OF MARKS, 100. PASS NUMBER, 40.

Wednesday, November 9, 1892.

(*Two hours allowed.*)

1. Two sides of a triangle are 272 ft. and 336 ft. long respectively; the angle opposite to the longer side is 54°: draw the triangle to the scale of an inch to 80 ft., and note the number of degrees in the other angles and the number of feet in the third side.

2. A B C D is a rectangle; the lengths of A B and B C are 1,011 ft. and 842 ft. respectively: find the area in acres &c. to the nearest pole.

If P is a point taken in A B such that A P equals 200 ft., show how to divide the rectangle into three equal parts by straight lines drawn through P.

3. A stream of water flows over a horizontal sill 10 ft. long, with a velocity of $2\frac{1}{3}$ ft. a second: if two million gallons flow over in 24 hours, what is the depth of the water above the sill? N.B.—Take 25 gallons to equal 4 cubic feet.

4. What is the length of a chain in feet, and of a link in inches?

At the rate of an inch to 220 ft., what is the length in inches of a line that represents 2,000 links? Draw a line of that length and divide it so that it may be a scale by which distances can be read true to 20 links.

By the scale draw a line to represent 970 links.

5. Explain briefly the principle of the vernier.

If a scale of inches is taken and each inch is divided into eight equal parts, state how to construct a vernier which will enable the observer to read distances true to the sixty-fourth part of an inch. Draw a diagram roughly to show the position of the scale and vernier when the reading is $2\frac{29}{64}$ in.

	B	
0	720	
85	650	
112	550	
80	450	
0	360	0
	320	75
	200	130
	100	100
	000	0
	A	

6. Plot the boundary of one side of a field from the accompanying notes, using a scale of one inch equal to one chain, and calculate the areas between A B and the boundary.

EXAMINATION IN MECHANICS AND NATURAL PHILOSOPHY.

MAXIMUM NUMBER OF MARKS, 200. PASS NUMBER, 75.

Wednesday, November 9, 1892.

(*Three hours allowed.*)

1. Draw a square; suppose that particles are placed one at each angular point, and that their masses are 2, 1, 1, 1 respectively: show the position of their centre of gravity in the diagram.

If we suppose the square to be a lamina of uniform density and that its mass is 1, show, also, the position of the centre of gravity of the whole.

2. Draw a triangle A B C, with its base A B horizontal and C below A B; let A B = 6 in., B C = 5 in., and C A = 2·5 in.; let A C and B C represent strings fastened to fixed points A and B, and carrying a weight of 30 lb. fastened to C: find, by a construction drawn to scale, the pull which the weight exerts on each of the fixed points A and B.

3. Describe briefly a pair of toothed wheels working together on parallel axes, such as may be seen in a crane.

If the driving wheel has seven teeth, and the driven wheel (or follower) has eighty-four teeth, how many times must the driver be turned to make the follower turn five and a half times?

4. In mechanics, when is an agent said to do work?

Putting friction and resistance of the air out of the question, would it require an expenditure of work to make a body slide with a given velocity along a horizontal plane, and if any, for what purpose?

If the plane were slightly tilted up, how would this circumstance affect the answer?

5. What is the name commonly given to the force which in one second imparts to a mass of one pound a velocity of one foot per second?

What multiple of that force is the force which in 3 seconds imparts to a mass of 12 lb. a velocity of 20 feet per second?

6. State exactly the meaning of the letter g, commonly used in books of dynamics, and what is meant when it is said to equal 32. Is this number exact? If not, give a number that is more nearly exact.

7. If a body fell freely from rest, under the action of gravity only, through a distance of 300 yards, how many seconds would it take to fall, and what velocity would it acquire? ($g = 32$)

8. Define the specific gravity of a solid or liquid.

The specific gravity of alcohol is 0·8; that of olive oil is 0·92: how many pints of the former would weigh as much as 3 gallons of the latter?

9. State the relation between the volume, pressure, and temperature of a given quantity of gas.

A certain quantity of air is enclosed, and is found to exert a given pressure when it has a given volume and a temperature of 0° C. (absolute temperature, 273°); it is allowed to expand slowly, and is found to have four times its former volume, and to exert one-third of its former pressure: what is now its temperature measured on an ordinary Centigrade thermometer?

10. Six million gallons of water go down a fall of 11 ft. in every 24 hours: what is the horse-power of the fall? (One gallon of water weighs 10 lb.)

REPORT ON EXPERIMENTS ON PREVENTION AND CURE OF "POTATO DISEASE."

Experiments were commenced in 1891 by the Royal Agricultural Society, at the request of the Board of Agriculture, with a view to seeing how far prevention or cure of the "Potato Disease" could be effected by applying to the plants a dressing of the mixture known as *Bouillie Bordelaise*, and consisting of sulphate of copper, slaked lime, and water. The Report of the first year's experiments is published in Vol. II. Part IV., 3rd series of the Journal (1891), pages 828–835, and, as it was decided to continue the experiments, the following is the account of the second year's trials.

Six different potato-growing localities were chosen, viz. in Kent, Bedfordshire, Lincolnshire, Cheshire, Devonshire, and South Wales, these being the same counties as were selected last year, but, with the exception of Messrs. Malden's farm in Bedfordshire, fresh districts were in each case chosen for the experiments of 1891–2.

The names of those who kindly undertook to carry out the experiments were :—

Mr. Thomas Scott, Ditton Court, Maidstone, Kent.
Messrs. Malden Bros., Cardington, Beds.
Mr. G. C. Healey, Deeping St. Nicholas, Spalding, Lincolnshire.
Lord Egerton of Tatton, Tatton Park, Knutsford, Cheshire.
Mr. W. P. Vosper, Merafield, Plympton, Devonshire.
Mr. Thomas Brown, Kingswood Farm, Pembroke Dock, S. Wales.

To these gentlemen the thanks of the Society are due for the care and attention with which they carried out the trials, and for the ready help which they gave to the superintendent on the occasion of his visits. The superintendence of the experiments was entrusted to Mr. Henry Giles, whose services were most kindly lent to the Society by Mr. Garrett Taylor, of Norwich, though at considerable personal inconvenience. Mr. Giles visited each experimental station whenever necessary, and saw to the preparation of the *bouillie bordelaise* and its different applications to the crops, as well as to the final weighings of the produce. Mr. Giles's duties were discharged with the promptitude and careful attention which he has shown in the practical work of the experiments of the Norfolk Chamber of Agriculture, and his management of the present series was in every way satisfactory. Mr. Carruthers, the Society's consulting botanist, examined the different samples of leaves which, according to instructions, were sent up from any of the stations at which disease was believed to have made its appearance. In addition, Mr. Carruthers devoted some ground by the side of his house to the carrying on of observations upon the progress of the disease and on the nature of the action of the *bouillie bordelaise* upon the parasitic fungus (*Phytophthora infestans*) attacking the potato.

In 1891 only a single variety was experimented upon at each station, but the present series was considerably more extensive, and the endeavour was made to secure at each station not one crop only, but three different ones, representing respectively :—

(*a*) An EARLY variety of potato.
(*b*) A MEDIUM variety.
(*c*) A LATE variety.

At the same time it was felt not to be desirable to interfere with local considerations, and, accordingly, it was not laid down what particular varieties should be grown, but inquiries were made with a view of selecting those growers who would in the ordinary course have grown more than one kind of crop. Consequently, the varieties chosen were those which were in ordinary use in each locality.

It was further arranged to have in the case of each variety of potato three plots set aside for the experiment, as follows :—

Plot A for EARLY application of the *bouillie* (before any disease appeared).
Plot B for LATE application of the *bouillie* immediately upon disease making its appearance).
Plot C to be left untreated.

The maximum size of the plots was to be half an acre, the minimum size one-quarter acre, and they were to be divided off from the rest of the field, and from one another by small paths, so as to keep them distinct.

The composition and strength of the *bouillie bordelaise* mixture was the same as in the preceding year, viz. :—

20 lb. sulphate of copper,
10 lb. lime (unslaked),
100 gallons water,

this being, accordingly, a two per cent. strength solution of sulphate of copper. Particular care was taken to employ good and pure materials, more especially as some experiments conducted by other societies in the previous year were believed to have failed owing to the impurity of the materials used. The sulphate of copper was obtained from Messrs. Saunders, Fielding & Co., 50 Lime Street, London, E.C., and was tested by Dr. Voelcker previous to the sending out of ½ cwt. kegs of it to each experimenter. Samples of the lime locally obtained and intended to be used were also sent to Dr. Voelcker, whose examination of them proved very necessary, as, in three cases out of the six, the samples first sent were unsuitable, they being either not properly burnt, or already slaked, or otherwise impure. Ultimately, good lots were obtained at all the stations, though in some cases the lime had to come from other districts.

The machine used for distribution of the *bouillie* was the "Eclair" machine of M. Vermorel, obtained from Messrs. Charles Clarke & Co., Windsor Chambers, 33 Great St. Helens, London, E.C. It is described in the Journal, 3rd series, Vol. II., pp. 232–3.

A slight lengthening of the tube carrying the nozzle for spraying was found desirable in order to distribute the dressing well on the underside of the leaves of the plant. The *bouillie* was made as before, by roughly pounding the sulphate of copper crystals, placing them in a bag suspended in a wooden tub containing water, slaking the lime with water, and, when cool, pouring it stirred up in water into the sulphate of copper solution, a sieve being interposed to hold back any lumps, stones, &c., which might be in it and so tend to block up the spraying machine. By having the materials quite cool when mixed, and by keeping the liquid constantly stirred during the mixing, no difficulty was experienced in getting the bright-blue colour characteristic of properly made *bouillie*, as well as the rapid settling down of a whitish-blue deposit which left above it a quite clear, colourless liquid, containing no copper, the latter being entirely thrown down in the deposit.

The different varieties of potato experimented on were :—

(*a*) Early varieties .	"Beauty of Hebron" (Kent and Pembroke).
	"Myatt's" (Lincolnshire).
(*b*) Medium . . .	"Snowdrop" (Kent and Lincolnshire).
	"White Elephant" (Beds and Pembroke).
	"Abundance" (Cheshire).
(*c*) Late . . .	"Magnum Bonum" (Kent, Lincolnshire, Devon).
	"Imperator" (Beds).
	"Bruce" (Devon and Cheshire).
	"Irish Flounder" (Pembroke).

The above distinctions are, of course, not absolute ones, a crop being considered "medium" in one district whilst it may be relatively "late" in another. Thus, the "Magnum" is considered a "medium" crop in Devon, relatively to the "later" crop "Bruce," although it generally ranks as a "late" or "main" crop.

Profiting by the experience furnished last year, the intention was to apply the first or "early" application of the *bouillie* to the A plots about a fortnight before the time at which experience told the experimenters that the "disease" might be expected to appear on each crop.

Mr. Giles's visits were arranged in accordance with this plan, and inquiries were made from time to time as to the progress of the crops and the likelihood of the appearing of disease.

In every case the A plots were sprayed well in advance of the outbreak of disease, and the B plots as soon after notification of the appearance of disease as was possible, Mr. Giles at once proceeding to the spot on receipt of telegraphic notice.

Two of the experimenters [Mr. Scott and Mr. J. T. Smith (for Lord Egerton)] varied the inquiry and increased its interest by dividing the A plots (early dressing) into two halves, giving one half a single application only of the dressing, and two applications to the other half. At Messrs. Malden's the A plots of the "White Elephant" were dressed once only, but the "Imperator" twice. At Mr. Healey's the A's were all dressed twice, but only once at Mr.

Vosper's and at Mr. Brown's. In no case were the B plots (late application) dressed more than once, namely, on the appearance of disease.

The cost of the application varied, of course, with the number of times it was put on, and the amount of foliage. For an early first dressing from 100 to 120 gallons were generally used, and 120 gallons for a second early application ; for the B plots (late application) 120–140 gallons was the usual amount, but in one case (Mr. Healey's "Magnum"), where the tops were very luxuriant, as much as 200 gallons was required. The sulphate of copper cost 18*s.* a cwt. and the lime about 10*s.* a ton, whilst the actual work of spraying may be put at 5*s.* per acre. A single application of 100 gallons per acre would accordingly cost about 3*s.* 4*d.* for material and 5*s.* for labour, altogether 8*s.* 4*d.* ; one of 120 gallons 9*s.* altogether, one of 140 gallons 9*s.* 8*d.*, and a dressing, first of 100 gallons and then another of 120 gallons, would cost 17*s.* 4*d.* per acre altogether. In the case of Mr. Vosper's (Devon) experiments, owing to a misunderstanding, the B plots (late application) were not dressed at all, and Mr. Giles, not having been informed of the appearance of disease, did not go there a second time. In one other instance, Mr. Giles did not dress the B plots (late application), namely at Mr. Brown's, Pembroke Dock. Here no disease appeared at all on two of the three crops, and, thus, for the purposes of the inquiry the results might be omitted from consideration. As to the third variety, there was some uncertainty about the existence of disease, and Mr. Brown weighed the crops himself. The several experiments may now be treated of in their order. The particulars as to quantities applied, dates of application, &c., are given in the tables. In comparing the gain in crop with the cost of dressing it will be seen that, taking the crop at about 55*s.* a ton all round, an increase of 4 cwt. per acre in crop would pay for a dressing costing 10*s.*, and an increase of 7 cwt. per acre for one costing 18*s.* an acre.

1. *Kent.—Mr. Thomas Scott's Farm.* Mr. Scott was anxious to try the difference between giving the crop *one* and *two* dressings, applied early, and this was accordingly done. Disease appeared on the "Beauty of Hebron" and "Snowdrop" before it did on the "Magnum." It was less marked on the earlier than on the later dressed plots. The "Magnum" had particularly luxuriant haulms, and the tops of the A plots that had been twice dressed early remained growing after those on the other plots had died off.

The potatoes were weighed on September 28.

"*Beauty of Hebron.*"—From the results obtained it will be noticed that there was not entire prevention of disease, but a marked diminution in it by the early dressing, for, whereas the untreated plot had 29 per cent. of diseased tubers, there was only from 2 to 4 per cent. on the early-dressed plots. Together with this was an increase in crop of over 3 tons per acre, and the application consequently paid excellently. The plot singly dressed had rather more disease, but a somewhat increased crop. The late application seemed both to increase the crop and to lessen disease, but, while it paid well it was not so remunerative as the earlier dressing.

TABLE I.—KENT.

Dressings per acre	Sound tubers per acre	Diseased tubers per acre	Percentage of disease	Increase of crop per acre, sound tubers	Cost of dressing per acre
"BEAUTY OF HEBRON"					
	t. cwt. qr. lb.	t. cwt. qr. lb.	Percent.	t. cwt. qr. lb.	*s.* *d.*
A 100 gals., June 29	10 0 0 0	0 8 0 0	3·84	3 8 0 0	8 4
Aa {100 „ „ „ / 120 „ Aug. 4}	9 18 0 0	0 4 0 0	1·98	3 6 0 0	17 3
B 120 „ „ „	8 14 0 0	2 0 0 0	18·69	2 2 0 0	9 0
C ——	6 12 0 0	2 14 1 4	29·14	—	—
"SNOWDROP"					
A 100 gals., June 29	9 18 2 8	0 16 0 0	7·45	3 7 3 20	8 4
Aa {100 „ „ „ / 120 „ Aug. 4}	11 2 3 4	0 8 0 0	3·46	4 12 0 12	17 4
B 120 „ „ „	7 17 0 20	1 6 0 0	14·19	1 6 2 4	9 0
C ——	6 10 2 16	2 16 0 0	30·00	—	—
"MAGNUM BONUM"					
A 120 gals., July 15	10 5 2 24	0 4 1 4	2·04	0 10 1 4	9 0
Aa {120 „ Aug. 4 / 120 „ „ „}	11 16 0 0	—	none	2 0 2 8	18 0
B 120 „ „ 29	9 13 1 20	0 3 1 20	1·74	0 2 0 0 [decrease]	9 0
C ——	9 15 1 20	0 4 0 0	2·00	—	—

Plot A, early application; B, late application; C, untreated.

"*Snowdrop.*"—Early applications lessened disease from 30 per cent. to 3·5 and 7·5 per cent., a largely increased crop also resulting. The advantage was with the double dressing. Late dressing also increased the crop, paying for the application, and it lowered disease from 30 per cent. to 14 per cent.

"*Magnum.*"—This crop had very little disease, and, on the plot dressed twice before disease came, there was entire absence of disease. There was some gain of crop, more than enough to pay the cost of application from the early dressings, the double dressing being the better. A small decrease of crop resulted from late application. Owing to the small extent to which disease prevailed, the influence of the dressing on prevention of disease is not marked.

The general result of Mr. Scott's experiments is to show a marked lessening of disease and also increase of crop from dressing the plots early, a double dressing before disease appeared being, on the whole, the best. The late applications had a less marked effect, though in the same direction, and there was only one case of loss through the applications, and that a very slight one.

2. *Bedford. Messrs. Malden Brothers' Farm.*—There was not much disease here. The crops were weighed September 21 ("White Elephant") and November 8 ("Imperator"). With the "White Elephant," an early dressing reduced disease from 5·5 per cent. to ·05 per cent. and gave also a paying increase of crop. A still larger gain of crop was obtained by the later dressing, but there was more

disease. Both applications were effectual. With the "Imperator," a lessening of disease from 3·28 per cent. to ·80 per cent., together with large increase of crop, was obtained by the early dressing applied twice, but the later application showed neither lowering of disease nor gain of crop.

TABLE II.—BEDFORDSHIRE.

Dressings per acre	Sound tubers per acre	Diseased tubers per acre	Percentage of disease	Increase of crop per acre, sound tubers	Cost of dressing per acre
	"WHITE ELEPHANT"				
	t. cwt. qr. lb.	t. cwt. qr. lb.	per cent.	t. cwt. qr. lb.	s. d.
A 120 gals., July 14	7 7 2 5	0 0 2 25	·05	0 19 0 4	9 0
B 135 „ Aug. 16	8 14 2 21	0 2 1 26	1·40	2 6 1 12	9 6
C ——	6 8 1 9	0 7 1 24	5·49	—	—
	"IMPERATOR"				
A { 120 gals., July 27 / 120 „ Sept. 5 }	12 6 0 0	0 2 0 0	·80	3 9 2 0	18 0
B 120 „ „ „	7 18 2 0	0 4 1 12	3·73	0 18 0 0 [decrease]	9 0
C ——	8 16 2 0	0 6 0 0	3·28	—	—

Plot A, early application; B, late application; C, untreated.

The general result here is to show the efficacy of an early dressing, applied once, or, if necessary, twice, both in lessening disease and in increasing crop.

3. *Lincolnshire. Mr. G. C. Healey's Farm.*—Disease was but slight with the "Myatt's Ashleaf," rather more with "Snowdrop,"

TABLE III.—LINCOLNSHIRE.

Dressings per acre	Sound tubers per acre	Diseased tubers per acre	Percentage of disease	Increase of crop per acre, sound tubers	Cost of dressing per acre
	"MYATT'S ASHLEAF"				
	t. cwt. qr. lb.	t. cwt. qr. lb.	per cent.	t. cwt. qr. lb.	s. d.
A { 90 gals. July 21 / 100 „ Aug. 6 }	7 5 2 0	0 3 0 0	2·02	0 11 2 0	16 3
B 120 „ „	6 18 0 0	0 4 0 0	2·81	0 4 0 0	9 0
C ——	6 14 0 0	0 4 2 0	2·12	—	—
	"SNOWDROP"				
A { 120 gals. July 21 / 100 „ Aug. 6 }	9 11 0 0	0 1 0 0	·52	2 17 0 0	17 3
B 120 „ „	7 14 0 0	0 6 0 0	3·75	1 0 0 0	9 0
C ——	6 14 0 0	0 13 0 0	9·40	—	—
	"MAGNUM BONUM"				
A { 90 gals. July 21 / 120 „ Aug. 6 }	10 7 2 0	none	—	2 15 2 0	17 0
B 200 „ „ 21	8 8 0 0	„	—	0 16 0 0	16 8
C ——	7 12 0 0	„	—	—	—

Plot A, early application; B, late application; C, untreated.

and entirely absent in the case of the "Magnum." No lessening of disease occurred in the case of the "Myatt's," but a slight increase of crop (which just covered the cost of application) was obtainable from both early and late dressings. With the "Snowdrop," an early application reduced disease from 9·4 per cent. to ½ per cent. and largely increased the crop. The later application, though not so successful either in lessening disease or in increasing the crop, still paid well for using it.

In the case of the "Magnum," as there was no disease to check, the crop-increases alone need be taken, the early application largely augmenting the yield, and the later one less so, but still remuneratively. The large amount of dressing required on the B plots is noticeable, the tops having been very large. These results show that both early and late applications pay well, increasing the crop and reducing disease, the earlier dressing being the better in both respects.

4. *Cheshire. Lord Egerton of Tatton's Home Farm.*—Mr. J. T. Smith, Lord Egerton's agent, wished also to try, in some cases, the

TABLE IV.—CHESHIRE.

Dressings per acre	Sound tubers per acre	Diseased tubers per acre	Percentage of disease	Increase of crop, sound tubers, per acre	Cost of dressing per acre
	"ABUNDANCE"				
	t. cwt. qr. lb.	t. cwt. qr. lb.	per cent.	t. cwt. qr. lb.	s. d.
A 150 gals. July 8	10 14 0 24	1 5 0 0	10·45	2 9 3 4	9 11
B 140 " Aug. 26	9 18 0 16	0 18 2 24	8·61	1 13 2 24	9 7
C ——	8 4 1 20	1 2 3 12	12 20	—	—
	"BRUCE"				
A 120 gals. July 8	10 3 0 0	0 3 3 4	1·83	decrease 0 8 0 16	8 11
Aa {120 " " 8 / 140 " Aug. 26}	9 19 1 20	0 1 3 12	·92	decrease 0 11 2 24	18 7
B 140 " " 26	10 17 2 16	0 1 1 4	·58	0 6 2 0	9 8
C ——	10 11 0 16	0 2 2 8	1·10	—	—
	"MAIN CROP"				
A 110 gals. July 8	8 16 2 16	0 0 1 4	·16	decrease 0 3 0 8	8 8
Aa {110 " " 8 / 140 " Aug. 26}	9 3 0 0	0 0 0 24	·11	0 3 1 4	13 3
B 140 " " 26	8 5 1 12	0 0 1 12	·21	decrease 0 14 1 12	9 8
C ——	8 19 2 24	0 0 1 20	·23	—	—
	"IMPERATOR"				
A 130 gals. July 8	10 13 3 12	3 5 0 16	23·34	decrease 1 19 2 16	9 4
Aa {130 " " 8 / 140 " Aug. 26}	11 6 2 24	2 16 0 0	19·80	decrease 1 6 3 4	19 0
B 140 " " 26	13 4 0 0	1 7 2 24	9·50	0 18 2 0	9 8
C ——	12 13 2 0	1 19 1 4	13·41	—	—

Plot A, early application; B, late application; C, untreated.

relative influences of *once* and *twice* dressing the crop. Disease occurred to a certain extent in the "Abundance" and "Imperator," but only very slightly in the "Bruce" and "Main Crop." The potatoes were weighed October 5th and 6th.

"*Abundance.*"—Increase of crop, to a well-paying extent, resulted from both early and late applications, but the decrease of disease was less marked; the later dressing, however, was the more effectual in staying disease.

"*Bruce.*"—The influence of the dressings was here, in each case, to lessen the crop, nor was any result in lessening disease apparent.

"*Main Crop.*"—Here again, where disease was so slight, no preventive influence was shown from the dressings, and the crop was, in all cases but one, reduced slightly as well, the exception being with the plot twice dressed early, but where, however, the increase did not pay for the application.

"*Imperator.*"—Decrease of crop, again, was the result of the dressings, and there was even more disease on the early-treated plots than on the untreated plots. On the other hand, the late dressing seems to have lessened disease slightly and to have given a return that just paid for the application.

These results in Cheshire are somewhat anomalous, they showing in one case ("Imperator") increase of disease from early dressing of the crop, and increase of yield in the case of three varieties out of the four tried. The conclusion, therefore, is not satisfactory to the use of the dressing, be it early or late application, more especially the former. It was noted, however, that the soil varied considerably in texture on different parts of the field, and this not improbably had as much to do with the anomalous results as anything else.

5. *Devon. Mr. Vosper's Farm.*—It had been intended to experiment on "Early Puritan," but the crop had gone too far before the dressing could be put on, and so it was omitted. Unfortunately

TABLE V.—DEVON.

Dressings per acre	Sound tubers per acre	Diseased tubers per acre	Percentage of disease	Increase of crop, sound tubers, per acre	Cost of dressing per acre
"MAGNUM BONUM"					
	t. cwt. qr. lb.	t. cwt. qr. lb.	per cent.	t. cwt. qr. lb.	*s.* *d.*
A 125 gals. July 22	8 13 1 24	0 7 2 0	4·14	2 3 1 24	9 2
C ——	6 10 0 0	0 19 0 0	12·75	—	—
"BRUCE"					
A 125 gals. July 22	9 14 3 4	0 3 1 4	1·65	1 12 3 4	9 2
C ——	8 2 0 0	0 16 0 0	8·98	—	—

Plot A, early application; C, untreated.

also, through Mr. Giles not being informed of the occurrence of disease, the B plots (late application) were not dressed. Consequently the trial was confined to the efficacy of the early applica-

tions. There was a moderate amount of disease in the crops made use of. With "Magnum," disease was reduced from 12·75 per cent. to 4 per cent., and, concurrently, a large gain of crop was obtained. With "Bruce," disease was lessened from 9 per cent. to 1·65 per cent., and a considerable increase of crop was yielded also.

These results were distinctly favourable to the use of the early application.

6. *South Wales. Mr. Thomas Brown's Farm.*—As already stated, the trial plots were in two cases free from any disease, and had therefore no bearing on the question of the efficacy of the *bouillie bordelaise* in preventing or in checking disease. A decrease of crop was the result in one instance. The crops were singularly small, less than 2½ tons per acre of the "White Elephant" being raised, and only 4 tons per acre of "Beauty of Hebron." It would

TABLE VI.—PEMBROKE.

Dressings per acre	Sound tubers per acre	Diseased tubers per acre	Percentage of disease	Increase of sound tubers per acre	Cost of dressing per acre
	"BEAUTY OF HEBRON"				
	t. cwt. qr. lb.	t. cwt. qr. lb.	per cent.	cwt. qr. lb.	s. d.
A 100 gals. June 18	4 1 2 0	—	—	decrease	
C ——	4 6 1 0	—	—	4 3 0	8 4
	"WHITE ELEPHANT"				
A 100 gals. July 4	2 9 0 0	—	—	decrease	
C ——	2 9 3 14	—	—	0 3 14	8 4
	"IRISH FLOUNDER"				
A 100 gals. June 18	6 8 1 16	0 17 2 16	12	12 3 2	8 4
C ——	5 15 2 14	1 4 3 26	17·67	—	—

Plot A, early application; C, untreated.

hardly be satisfactory to consider these results conclusive. A somewhat larger crop was shown with the "Irish Flounder," and though there was some doubt as to the actual appearance of disease, it was found, on raising the crop, that from 12 to 17½ per cent. were bad, and that where the dressing had been used (plot A) a larger crop of sound tubers was obtained and a less proportion of bad ones.

CONCLUSIONS.—Putting together the results obtained from the different stations, excluding Cheshire, there is a unanimous verdict upon four points:—

1. That the dressing with *bouillie bordelaise*, though it does not entirely prevent disease, has a marked effect in lessening the extent to which disease spreads.

2. That associated with the lessening of disease is an almost certain increase of crop, which more than pays for the cost of application of the dressing.

3. That the best treatment is an early application of the *bouillie bordelaise* before disease has made its appearance, and that this

should be repeated if the marks of the first dressing have been removed by rain.

4. That, even if delayed until disease comes, a lessening of the spread of disease may to some degree be effected by a late dressing, and the crop, as a rule, will be sufficiently increased to pay for the application.

These results are borne out by four of the five stations at which the experiments were complete, those in Kent, Bedfordshire, Lincolnshire, and Devon exemplifying them almost in every particular, even with the many plots comprising the experiments at each spot. The results in Cheshire are the only ones that tell adversely to the utility of the dressing, and even here, in the case of one of the four crops, a large gain in yield was experienced. The general results may accordingly be stated as distinctly showing the advantage of using the *bouillie bordelaise* dressing, whether disease appears or not, and that the best plan is to apply the dressing about a fortnight before disease is likely to appear, and to renew it when washed off.

The foregoing Report on this year's experiments with *bouillie bordelaise* has been drawn up by Dr. Voelcker.

The following note is supplied by Mr. Carruthers on the experiments with potatoes conducted by him at Norwood :—

The plot of ground on which the experiments were carried out had been in grass for many years; after it was trenched and well dunged, the potatoes were planted in the end of April. The seed tubers belonged to twelve varieties, and were planted in as many plots, each 16 feet by 8 feet and containing 32 plants, so that every plant had 4 square feet to itself. There were consequently 384 seed potatoes planted, but of these seven failed to germinate.

The appearance of the plants above ground extended from May 19 to June 13. The earliest variety was the "Early Regent," all the plants of it being visible by May 27. This was followed closely by the "Magnum Bonum" and the "Abundance," and then the "Bruce," the "Holborn Prolific," and the "Canon," all of which finished their germination within the fortnight. The "Beauty of Hebron" and the "Holborn Reliance" finished in the third week, while the "White Elephant," "Carter's Surprise," "Myatt's Ashleaf," and the "Imperator" extended into the fourth week.

Six of the potatoes were attacked shortly after germinating by a fungus which destroyed the tissues of the stem just above the ground, so that the leaves and the upper part of the stem fell to the earth and withered. The brown mycelium penetrated the cellular tissues, and spread itself over the surface of the stem at that part; portions of the stem were kept in a moist warm atmosphere, but although the mycelium continued to grow and spread over the glass, it produced no fructification, so that the species doing this injury could not be determined.

There was a vigorous growth of haulm above ground, but the

soil in which they were planted, being stiff London clay, was very unfavourable for the proper development underground, and none of the tubers were fully ripened. No disease appeared in the plots. But, after the middle of August, some diseased haulms were spread among the potatoes. The only plot that was thereafter attacked by the fungus was "Carter's Surprise." The leaves had already begun to lose their vigour, and the disease speedily completed the work of destruction, rendering it impossible to try the *bouillie bordelaise.* The plots which were still in vigorous growth were carefully watched, but no indications of disease were detected in the leaves above ground, nor in the potatoes when they were dug. It was proposed to treat the potatoes after they were attacked, and not to use the *bouillie* in these small plots as a preventive.

Careful observations were made twice daily of the temperature (maximum and minimum, wet and dry bulb), of the barometrical pressure, and of the rainfall, during the whole progress of the experiment. These observations had no importance, however, seeing that the disease did not appear in the plots.

CHARLES WHITEHEAD,
Chairman of the Seeds and Plant Diseases Committee.

December 6, 1892.

THE WOBURN EXPERIMENTS ON PREVENTION AND CURE OF "POTATO DISEASE."

THE Royal Agricultural Society, in addition to the experiments which it was conducting throughout the country on behalf of the Board of Agriculture (described on pp. 761–70 of the present number of the Journal), determined to institute others of its own, and the Woburn Sub-Committee drew up an extensive scheme for carrying out an inquiry at the Society's Experimental Farm at Woburn (Bedfordshire). One great advantage in this plan was that Mr. Elliott, the Resident Manager of the Farm, was always upon the spot, and that he is experienced in work of this kind.

The soil at the Woburn Farm is a light sandy loam, very suitable for potato-growing. The field chosen was that known as Lansome Field, on a portion of which field experiments have been in progress for some years, but which is unfortunately not sufficiently uniform all over to make it a good field for close scientific experiment. As, however, these trials were rather for comparative purposes, namely, to test the efficacy of the *bouillie bordelaise* mixture in preventing or in checking the spread of potato-disease, the known slight inequalities of the land were not of such material consequence, and though they had appeared in the course of experiments requiring close accuracy, they were not more than would be found in any ordinary field selected as suitable for an experiment such as proposed.

Plan of Experiment.—It is desirable here to note the points of difference between the present experiments and those conducted by the Society in other parts of the country. In the first place, the dressings employed comprised not only the ordinary *bouillie bordelaise*, made up of sulphate of copper, freshly-burnt lime, and water, but also the kind known as *bouillie bordelaise sucrée*, which contains molasses in addition to the other ingredients. This was tried, inasmuch as some laboratory experiments made in France by M. Girard pointed to the mixture containing sugar as being more efficacious than the ordinary *bouillie*, the syrup probably helping to retain the copper salt more firmly on the leaves and thus rendering it less likely to be removed by heavy rain. The ordinary *bouillie* used was made up with double the quantity of lime used in the Society's other experiments, this composition being, however, one of those freely recommended in France; it had the advantage, too, of making the comparison between the inclusion and the omission of molasses more definite. The dressings employed were, accordingly :—

Mixture I. *Bouillie Bordelaise.*
20 lb. sulphate of copper.
20 „ lime (unslaked).
100 gallons water.

Mixture II. *Bouillie Bordelaise Sucrée.*
20 lb. sulphate of copper.
20 „ lime (unslaked).
20 „ molasses.
100 gallons water.

In addition, trials were made of two other methods of treatment which have been advocated. The first was, to steep the "seed" potatoes in a solution of sulphate of copper before planting them, as is often done in the case of seed-wheat. The second was, to steep the seed-potatoes for twenty-four hours in a solution made up as follows :—

6 lb. sulphate of ammonia.
6 lb. nitrate of potash.
25 gallons water.

A few small plots were devoted to these two last-named experiments.

The general experiment with the *bouillie bordelaise* treatment was divided into two parts :—

(*a*) A main experiment on three selected varieties of potato.

(*b*) An experiment on a smaller scale with varieties specially susceptible to disease.

(*a*) *The Main Experiment.*—Three well-known varieties of potato, representing respectively an EARLY, a MEDIUM, and a LATE crop, were chosen. These were "Beauty of Hebron" (early), "Scotch Regents" (medium), and "Champions" (late). Three plots, each one-quarter acre in size, were devoted to each variety, as follows :—

Plot A for EARLY application of the dressing (before disease appeared).
" B " LATE " " (on appearance of disease).
" C to be left untreated.

The quarter-acre plots were subdivided, and while on one-half the ordinary *bouillie bordelaise* was to be applied, the other half was to be dressed with the *bouillie bordelaise sucrée*, the C plots in either case remaining undressed. The plots of the first half (ordinary *bouillie*) will, for convenience, be designated plots Aa, Ba, Ca.

(*b*) *Experiment on Special Varieties.*—Smaller plots of $\frac{1}{16}$ acre each were set apart for trials with nine different varieties of potato which were believed to be specially liable to disease. Three plots, as before—one for early, one for late application of the dressing, and a third to be left untreated,—were marked out, the dressing consisting of the *bouillie bordelaise sucrée.*

The varieties selected were the following :—

Early kinds—"Myatt's Ashleaf," "Early Puritan," "Early Rose."
Medium kinds—"Dalmahoy," "White Elephant," "Reading Giant."
Late kinds—"Imperator," "Schoolmaster," "Victoria."

The varieties chosen for the "steeping" experiment with sulphate of copper were "Early Shaw" and "Village Blacksmith," and the same varieties also for the experiment with steeping in the sulphate of ammonia and nitrate of potash mixture. Each plot was $\frac{1}{32}$ acre in size.

Preparation of the Bouillie Bordelaise Mixtures.—In the preparation of the *bouillie bordelaise sucrée* certain precautions had to be observed, these being set out in M. Perret's recipe for making it. The molasses must first be mixed with water, and the freshly slaked lime and water be added to it with constant stirring. The sulphate of copper solution must be separately prepared, and then be added to the lime and sugar mixture, the whole being kept vigorously stirred. A decomposition then sets in, resulting in the sucrate of lime (formed by the bringing together of the sugar and the lime) changing into sulphate of lime, and the sulphate of copper into sucrate of copper. An intense blue colour is thus obtained, and the mixture settles down into a whitish-blue deposit which contains all the copper, and a clear liquid above. If the molasses be added first to the copper solution and the lime be added afterwards, a reduction of the copper sulphate occurs, resulting in the formation of a suboxide of copper, the mixture acquiring a yellow and finally a red colour.

The *bouillie bordelaise sucrée* should be always used when freshly prepared, as, after standing for some time, it is apt to turn to a dirty-green colour, owing to slight reduction taking place.

It may be well to note here that the vessels employed in making either of the *bouillie* mixtures should be of *wood* and not of *metal*, as the latter would be quickly eaten into holes by the mixture, the composition of which would become modified. At Woburn two wooden tubs holding 10 or 12 gallons each were found very suitable

for preparing the lime and sulphate of copper solutions and a 40-gallon paraffin cask for making the mixture in. The actual amount made each time was $33\frac{1}{3}$ gallons. Twenty gallons of water were stirred up in the large cask with $6\frac{2}{3}$ lb. of molasses; $6\frac{2}{3}$ lb. of quicklime were put in one of the small wooden tubs with $6\frac{2}{3}$ gallons of water and allowed to cool down, after which the milk of lime was added little by little to the molasses and water, the whole being kept stirred. In a second wooden tub $6\frac{2}{3}$ lb. of pounded sulphate of copper were dissolved in a little boiling water, and, when dissolved, cold water was added, making the whole up to $6\frac{2}{3}$ gallons. The latter solution was then added little by little to the milk of lime and molasses mixture in the large cask, stirring being kept up vigorously all the time. This gave a bright blue liquor, made up as follows:—

	lb.		gallons
Molasses	$6\frac{2}{3}$	. . . with water	20
Lime	$6\frac{2}{3}$	. . . ,, ,,	$6\frac{2}{3}$
Sulphate of copper	$6\frac{2}{3}$	. . . ,, ,,	$6\frac{2}{3}$
	20		$33\frac{1}{3}$

this being the required strength of the *bouillie bordelaise sucrée* (Mixture II.).

In making up the ordinary *bouillie bordelaise* without sugar, $6\frac{2}{3}$ lb. sulphate of copper were dissolved as before described, made up to $6\frac{2}{3}$ gallons with cold water, and added little by little to $6\frac{2}{3}$ lb. of freshly-burnt lime slaked down with $26\frac{2}{3}$ gallons of water and allowed to cool. This gave the necessary strength of the Mixture I.

In the steeping experiment with sulphate of copper, a solution of 2 per cent. strength sulphate of copper was used, and the whole tubers were immersed in it for twenty-four hours, then taken out and left to dry. In the other steeping experiment, whole tubers were put for twenty-four hours in a bath composed of 6 lb. sulphate of ammonia, 6 lb. nitrate of potash, and 25 gallons of water, after which they were taken out and left for another twenty-four hours to swell, being then planted whole. This latter method is said to have resulted in producing in France a crop of 42 tons per acre!

The sulphate of copper was tested before using, and was found to be pure, but considerable difficulty was experienced in getting good lime locally, so that, ultimately, burnt lime had to be obtained from Buxton. The sulphate of copper was purchased from Messrs. Saunders, Fielding, & Co., 50 Lime Street, London, E.C.

Application of the Dressing.—Mr. Elliott paid a good deal of attention to the best way of applying the dressings, the quantities required, and the permanence of the application, and he has furnished useful notes on the several points. His method of procedure was,—after having prepared the $33\frac{1}{3}$ gallons of mixture in the 40-gallon cask, as mentioned in the last section,—to put the cask on a cart and convey it to the potato field. The contents were stirred up (other-

wise the deposit would settle down at the bottom) and baled out into the spraying machine. The machine used was the "Eclair" of M. Vermorel, sold by Messrs. Chas. Clarke & Co., Windsor Chambers, 33 Great St. Helens, London, E.C., the price of it being 35*s.* complete. This machine was found to work very effectually. Mr. Elliott thinks that a better plan than baling out the mixture would be to have a large wooden tap at the bottom of the cask and to fill the "Eclair" from it. He considers the work of applying the dressing rather heavy, the weight alone of the machine when full being considerable. A slight increase of the daily wage paid to the men was made, and this got over any difficulty. The man who applies the dressings should be provided with an old suit of clothes, as it is impossible to keep the spray away from the person using the machine.

Particular instructions were given that the spraying should be done as thoroughly as possible on the *under side* of the leaf. As Mr. Carruthers, the Society's Consulting Botanist, has pointed out, it is on the *under side* of the leaf that the potato is attacked by the spores of the fungus (*Phytophthora infestans*) settling on it and forcing its roots or *hyphæ*, as they are scientifically termed, into the *stomata* or openings which occur on the *under side* of the leaves, but far less numerously on the upper surface. On the upper surface, moreover, the leaf is provided with closely-set palisade cells which resist the entry of the *hyphæ* of the fungus, whereas these cells do not exist on the under side of the leaf. This view of the reasons that make it desirable to spray the *under side* especially is disputed by some practical men, including M. Vermorel himself, who maintains that effective spraying of the upper side of the leaves is ample, and that sufficient of the mixture finds its way below. But the botanical point involved is not questioned, and hence it seems sound reason and practice to guard the *lower* surface particularly, more especially as, in doing this, the operator cannot well fail to give a copious dressing to the upper surface at the same time. This, no doubt, involves the use of a larger quantity of the mixture, but it is the safer practice. With care it was found quite practicable to direct the nozzle of the machine under the leaves and, turning it upwards, to spray the under side of the leaves effectually.

Mr. Elliott found that when the tops of the plant were still small, one man working with an "Eclair" could spray half an-acre of potatoes per day, but that when the tops became larger, not above one-third of an acre a day could be done, and that when the tops grew very large it was impossible to spray each plant effectually without using a great amount of the dressing, as much as 200 gallons to the acre being occasionally required. It was found in general that the quantity used varied from 100 gallons to 170 gallons per acre, according to the size of the tops. For a first dressing 100 gallons was enough, and for an average crop 120 gallons per acre might be taken as a fair quantity.

The weather best suited to the application was found to be a good

drying day with moderate breeze; the dressing then dried on the leaves at once, and when this was the case it seemed to stick on them much longer than when put on upon a dull damp day. Mr. Elliott watched the dressed leaves carefully, and noted that the effect of the spraying could be found on the under side of the leaves quite six weeks after its application, although all trace of it had been washed off the upper surface of the leaves.

Cost of Dressing.—The raw materials were purchased as follows: Sulphate of copper (in half-cwt. lots in small wooden kegs), 18*s.* per cwt.; burnt lime (when purchased at a distance), 10*s.* per ton; molasses (purchased locally), about $1\frac{1}{2}d.$ per lb. A small addition must be made for carriage, but, taking it all round, it may be said that the general cost of the materials used in the two mixtures of *bouillie* were:—

	I. *Bouillie Bordelaise* *s.* *d.*	II. *Bouillie Bordelaise Sucrée* *s.* *d.*
For 100 gallons per acre . . .	3 6	6 0
„ 120 „ „ . . .	4 2	7 2
„ 140 „ „ . . .	4 10	8 4

To the prices of materials must be added the cost of the actual application. This Mr. Elliott estimated at from 4*s.* to 6*s.* an acre. Taking 5*s.* an acre as the average, this would give the total cost of using the dressing:—

	I. *Bouillie Bordelaise* *s.* *d.*	II. *Bouillie Bordelaise Sucrée* *s.* *d.*
For 100 gallons per acre . . .	8 6	11 0
„ 120 „ „ . . .	9 2	12 2
„ 140 „ „ . . .	9 10	13 4

The last valuation necessary to make is that of the produce, which is very difficult to fix even approximately, as so much depends upon the state of the market. This year, indeed, owing to the small prevalence of disease, potatoes in Bedfordshire were almost a drug in the market, and very great difficulty was experienced in getting rid of them at almost any price. The price would vary also for each kind of potato. From 45*s.* to 90*s.* per ton (of 40 bushels) were the variations, and it could not be said that, as regards the really saleable potatoes, taking them all round, a higher price than 55*s.* a ton on the farm could be put. As to the others, a good number had to be sold as "cattle" or "pig" potatoes, and did not realise more than 25*s.* or 30*s.* a ton.

Planting.—The field was ridged up well and dunged all over with about twenty loads of yard manure to the acre previous to the potatoes being put in; the tubers were set on the dung, and the ridges were split back. All the different varieties were set from April 15 to April 26, the early varieties first, and a nice steady rain succeeded the planting. The plants were bouted up June 10 to June 14. A severe frost on June 14 affected to some extent the

young growth of the "earlies."—On the plots ("Early Shaw" and "Village Blacksmith") where the tubers had been steeped in sulphate of copper or in the solution of sulphate of ammonia and nitrate of potash, only a stray plant appeared, the dressings having evidently destroyed the vitality of the tubers, for, on the corresponding untreated plots of both varieties the crop came up well.

Dates of Application of Dressing and Appearance of Disease.—The first dressing with *bouillie* was done on June 30, the earlier kinds having grown sufficiently by then ; the other varieties were dressed for the first time on July 6 and 7, and the whole was finished before any sign of disease appeared.

The plants grew on, and by the middle of August the "early" kinds were quite ready to take up, but still no disease came, so these crops, viz. "Beauty of Hebron," "Myatt's Ashleaf," "Early Rose," and "Early Puritan," were raised August 10 to 13, as also the "Dalmahoy" of the "medium" varieties on August 16. There were no diseased tubers in either of these crops. On August 24 it was noticed that the dressing had for the most part been washed off the leaves of the remaining plots, and directions were given that the plants should be again sprayed. This was begun on September 1, and the very same day (and before the spraying could be completed) disease began to make its appearance. Mr. Carruthers's examination of some of the leaves sent to him confirmed the presence of the fungus (*Phytophthora infestans*). The varieties most affected appeared to be "Schoolmaster," "Victoria," and "White Elephant." Thereupon not only were the previously dressed A plots (for *early* application) sprayed once more, but the B plots (for *late* application) were also treated. By September 9 all the A and B plots had been dressed. Bearing in mind that the A plots were those dressed *early*, before disease appeared, that the B plots were dressed *late*, on the appearance of disease, and that the C plots remained *untreated* throughout, the following notes, taken on September 3, may be given :

"White Elephant"—	A hardly attacked at all.
	B very badly diseased.
	C " "

Here a marked difference was seen between the A plot and the others.

"Reading Giant" .	A and B hardly touched. C one large patch in centre of plot diseased.
"Imperator" . .	A and C, leaves slightly spotted. B rather more attacked.
"Schoolmaster" . .	All plots slightly attacked; A less than the others.
"Victoria" . . .	All plots slightly attacked; A less than the others.
"Regent" . . .	All plots slightly spotted; no difference between them.
"Champion" . .	Hardly attacked at all; only a few spots here and there; no difference between the plots.

Thus it will be seen that, while the A plots were, generally speaking, rather less attacked than the B and C plots, there was only one instance—the "White Elephant"—where there was a marked difference in favour of the A's. This, however, it should be noted, was where disease was most prevalent. After September 3 the disease became much worse on all the plots. As the crop approached ripeness, a considerable difference was noted between the tops which had been sprayed (A's and B's) and those which had not been dressed. The tops of the sprayed plots remained green long after the haulms on the C plots had died down. All the remaining crops were dug and weighed October 11 to 25.

Notes on the Varieties.—The following notes were taken by Mr. Elliott upon the relative qualities of the different varieties:—

"Beauty of Hebron" .	Good early cropper; clean skin; shallow eye; very saleable.
"Myatt's Ashleaf" .	An early kidney potato; small cropper and hardly a field variety; the skin becomes scabby on the Woburn land.
"Early Puritan" . .	Early and fair cropper, but runs rather small.
"Early Rose" . .	Early, but not very saleable, as it is very apt to grow pink right through the tuber.
"Dalmahoy" . .	Medium early; good cropper; not a coarse skin, but rather scabby.
"Regent" . . .	Coarse-skinned; deep-eyed; very unsaleable.
"White Elephant" .	Good cropper (although liable to disease); cooks well; saleable, but does not keep well.
"Reading Giant" .	Good-looking potato; very heavy cropper—clean thin skin; saleable.
"Champion" . .	Coarse "cattle" potato; deep-eyed; goes hollow in centre and becomes rotten there; almost unsaleable.
"Imperator" . .	Very good cropper; clean skin; plant has very large tops; quite saleable.
"Schoolmaster" . .	Very fair cropper, but scabby, and not a saleable potato.
"Victoria" . . .	Average cropper; good cooker; apt to grow out of ground instead of pushing downwards.

From these notes, and the crop weights that follow, it will be gathered that the best potato among the "earlies" was the "Beauty of Hebron," among the "medium" crops the "Reading Giant," and of the "late" varieties the "Imperator."

The potatoes when dug were divided into sound and diseased tubers, which were weighed separately. The weights per acre of the respective varieties are given in the accompanying tables (pp. 780-81), which also show the influence of the early and late applications of the *bouillie* dressing.

Before proceeding to discuss the tables, the experiments in steeping the tubers before planting may be dismissed briefly by saying that they were quite unsuccessful. With regard to steeping in sulphate of copper, it was pretty well known to the scientific officers

of the Society that it would most probably result in destroying the vitality of the tubers, but the trial was made in consequence of a suggestion that if steeping seed-wheat in sulphate of copper prevented "smut," the disease in the potato crop might be similarly prevented. But the two cases are by no means analogous, for, with the wheat, the fungus is associated with unhealthy seed and is on the exterior of the seed, subsequently penetrating into it; whereas the fungus of potato disease arises from sources *external* to the plant and may be carried to the leaves of perfectly healthy plants. Again, while the germ of the wheat is protected by the hard casing of the seed, the potato tuber has only a delicate skin which is not sufficient to prevent the known destructive action possessed by a solution of sulphate of copper.

The steeping in a solution of sulphate of ammonia and nitrate of potash similarly destroyed the vitality, and fell very far short of producing the stated 42 tons per acre!

In connection with these steeping experiments it is well to mention that in a trial on potatoes carried out at Lord Egerton of Tatton's Home Farm, these two same methods were employed, and with precisely similar results to those obtained at Woburn.

The Results.—It now remains to discuss the results of the weighings, with a view to ascertaining the following principal points:—

1. Whether the application of the *bouillie* had a *preventive* effect.
2. Whether the application had a *curative* effect when disease had once appeared.
3. Whether the mixture *with* sugar or that *without* sugar was the more effectual.
4. Whether the application of the dressings had any influence in increasing or diminishing the produce.
5. Whether, on the whole, it *paid* to use either dressing.

It is advisable to consider the cases in which no disease whatever occurred separately from the others. These cases include all the "early" varieties and one "medium" variety ("Dalmahoy"). In these the influence of the dressings in preventing or checking disease is of course not apparent, and, generally speaking, it may be said of "early" potatoes that they are, as a rule, out of the ground before disease appears. It remains only, therefore, to follow the influence on the yield.

Series 1. "Beauty of Hebron."—It is very clear from the figures that the part of the field where the plots 1 A, 1 B dressed with the *bouillie bordelaise sucrée* occurred (for they were together at one end and the comparative ones dressed with the ordinary *bouillie* without sugar were at the other end) is poorer than the end where plots 1 Aa, 1 Ba were. The addition of sugar to the mixture showed no gain as compared with its omission. The dressing in each case showed a decrease of crop, the greater decrease being when the early application was used.

Series 4. "Myatt's Ashleaf."—A gain of crop was obtained by

TABLE I.—*Early Crops.*

Variety	Plot	Weight per acre of sound tubers	Weight per acre of diseased tubers	Per-cent. of diseased tubers	Increase of crop per acre	Decrease of crop per acre	Percentage of increase in crop	Percentage of decrease in crop	Cost of dressing per acre	Value of gain or loss in crop per acre	Nett profit or loss per acre
		tons cwt. qrs. lb.	tons cwt. qrs. lb.	per cent.	tons cwt. qrs. lb.	tons cwt. qrs. lb.	per cent.	per cent.	s. d.	s. d.	s. d.
"Beauty of Hebron"	1 Aa	6 11 1 20	none	none	—	1 13 0 14	—	20·13	18 4	− 91 0	−109 4
" "	1 Ba	8 0 0 0	"	"	—	0 4 2 6	—	2·76	9 2	− 12 4	− 21 6
" "	1 Ca	8 4 2 6	"	"	—	—	—	—	—	—	—
" "	1 A	5 16 0 0	"	"	—	1 8 1 20	—	19·68	24 4	− 78 4	−102 8
" "	1 B	6 1 0 8	"	"	—	1 3 1 12	—	16·17	12 2	− 63 11	− 76 1
" "	1 C	7 4 1 20	"	"	—	—	—	—	—	—	—
"Myatt's Ashleaf" .	4 A	5 8 3 12	"	"	0 7 2 24	—	7·62	—	24 4	+ 20 7	− 3 9
" " .	4 B	5 0 1 4	"	"	—	0 0 3 12	—	·84	12 2	− 2 0	− 14 2
" " .	4 C	5 1 0 16	"	"	—	—	—	—	—	—	—
"Early Puritan" .	5 A	6 17 1 4	"	"	1 3 0 0	—	20·12	—	24 2	+ 63 3	+ 39 1
" " .	5 B	6 5 0 0	"	"	0 10 2 24	—	9 37	—	12 2	+ 28 10	+ 16 8
" " .	5 C	5 14 1 4	"	"	—	—	—	—	—	—	—
"Early Rose" . .	6 A	6 16 2 8	"	"	1 12 3 12	—	31·68	—	24 2	+ 90 0	+ 65 10
" " . .	6 B	6 5 0 0	"	"	1 1 1 4	—	20·52	—	12 2	+ 58 5	+ 46 3
" " . .	6 C	5 3 2 24	"	"	—	—	—	—	—	—	—
"Dalmahoy" . . .	7 A	9 7 0 0	"	"	1 16 0 16	—	23·95	—	24 2	+ 99 0	+ 74 10
" . . .	7 B	8 6 2 8	"	"	0 15 2 24	—	10·41	—	12 2	+ 42 7	+ 30 5
" . . .	7 C	7 10 3 12	"	"	—	—	—	—	—	—	—

TABLE II.—*Medium Crops.*

"Scotch Regent" .	2 Aa	9 16 2 8	0 13 0 0	6·23	—	0 15 2 24	—	7·40	18 4	− 43 3	− 61 7
" " .	2 Ba	9 12 0 0	0 19 12 16	9·28	—	1 0 1 4	—	9·59	9 2	− 55 8	− 64 10
" " .	2 Ca	10 12 1 4	2 1 0 0	16·18	—	—	—	—	—	—	—
" " .	2 A	9 3 2 24	0 17 1 4	8·59	2 1 2 8	—	29·24	—	24 4	+114 1	+ 89 9
" " .	2 B	8 3 2 0	1 6 1 4	13·85	1 1 1 12	—	15·02	—	12 2	+ 58 5	+ 46 3
" " .	2 C	7 2 0 16	1 6 1 4	15·60	—	—	—	—	—	—	—

"White Elephant"	8 A	9 12 2 8	0 17 1 20	8·29	—	0 5 0 0	—	2·53	24 2	− 13 9	− 37 11
" "	8 B	8 8 0 0	2 16 0 0	25·00	—	1 9 2 8	—	14·92	12 2	− 81 1	− 93 3
" "	8 C	9 17 2 8	3 12 0 0	26·70	—	—	—	—	—	—	—
"Reading Giant" .	9 A	15 11 1 20	0 5 0 0	1·56	0 8 3 12	—	2·92	—	24 2	+ 24 0	− 0 2
" " .	9 B	15 8 3 12	0 2 2 8	·82	0 6 1 4	—	2·07	—	12 2	+ 17 2	+ 5 0
" " .	9 C	15 2 2 8	0 6 0 24	2·01	—	—	—	—	—	—	—

TABLE III.—*Late Crops.*

"Champion" . .	3 Aa	12 19 2 8	0 2 0 16	·81	—	1 2 3 12	—	8·09	18 4	− 62 6	− 80 10
" . .	3 Ba	14 11 0 8	0 2 0 24	·75	0 8 12 16	—	3·94	—	9 2	+ 23 4	+ 14 2
" . .	3 Ca	14 2 1 20	0 2 1 20	·85	—	—	—	—	—	—	—
" . .	3 A	10 14 0 0	0 2 2 0	1·15	—	1 12 3 12	—	13·31	24 4	− 90 0	−114 4
" . .	3 B	11 19 0 0	0 1 1 12	·80	—	0 7 3 12	—	3·18	12 2	− 21 3	− 33 5
" .	3 C	12 6 3 12	0 2 2 8	1·03	—	—	—	—	—	—	—
"Imperator" . .	10 A	13 0 1 4	0 10 2 24	3·95	0 14 2 8	—	5·93	—	24 2	+ 39 10	+ 15 8
. .	10 B	13 5 2 8	0 7 2 24	2·82	0 19 3 12	—	8·08	—	12 2	+ 54 3	+ 42 1
.	10 C	12 5 2 24	0 7 2 8	2·98	—	—	—	—	—	—	—
"Schoolmaster" .	11 A	8 12 2 8	0 2 0 16	1·22	—	2 0 1 4	—	18·92	24 2	−110 8	−134 10
" .	11 B	9 13 0 0	0 5 0 16	2·59	—	0 19 3 12	—	9·32	12 2	− 54 3	− 66 5
" .	11 C	10 12 3 12	0 6 0 16	2·81	—	—	—	—	—	—	—
"Victoria" . . .	12 A	10 2 0 0	0 5 1 20	2·61	2 17 0 16	—	39·44	—	24 2	+156 9	+132 7
" . . .	12 B	8 14 2 8	0 14 1 20	7·63	1 9 2 24	—	20·51	—	12 2	+ 81 1	+ 69 1
" . . .	12 C	7 4 3 12	0 15 2 8	9·70	—	—	—	—	—	—	—

Plots A dressed twice, before disease appeared, with *bouillie bordelaise sucrée.*

Plots B dressed once, upon appearance of disease, with *bouillie bordelaise sucrée.*

Plots C left untreated.

Plots Aa, Ba, dressed with the ordinary *bouillie bordelaise* without sugar.

Plots Ca, left untreated, to compare with Aa and Ba

the early dressing, but not quite enough to pay for the application. With the late dressing there was a slight loss.

Series 5. "Early Puritan."—Here there was a distinctly paying gain, more especially from the early application.

Series 6. "Early Rose."—The result was similar to the last, but the gain was a much-increased one.

Series 7. "Dalmahoy."—Again, a very large increase of crop, and, as before, more marked with the earlier application.

On the whole, therefore, there is a gain of crop with four varieties out of five, the result being a paying one in three cases, while in a fourth the cost is just about met. With one variety only ("Beauty of Hebron") was there a decrease.

The general result of the dressing, even when disease has not appeared, is favourable to the adoption of the remedy, and goes to show that the early application is decidedly the more beneficial, while the addition of sugar to the mixture would not appear to be an advantage, but only an increased expense.

Taking next the cases where disease appeared :—

Series 2. "Regent."—There was a considerable amount of disease here. The application, whether of the ordinary *bouillie bordelaise* or of the same with sugar, had a marked influence in decreasing disease. Nevertheless it did not succeed in preventing it altogether. When dressed early, disease was lessened in the one case by 10 per cent. and in the other by 7 per cent. The addition of sugar proved of no advantage in lessening disease, but (somewhat inconsistently, it must be said) the crop was largely increased, and paid excellently for the application. The heaviest crop, however, was not more than when no sugar was used.

Series 8. "White Elephant."—Here again was a good deal of disease. The early application of the mixture decreased disease very largely, though it did not prevent its appearance; the reduction was one from 26 per cent. down to 8 per cent. The late application was of only slight benefit, and evidently did not "cure" the disease when once it had appeared. As to the weight of crop, a slight decrease was shown with the earlier dressing, and a considerable one with the later.

Series 9. "Reading Giant."—This was a remarkably heavy crop—the heaviest of all the series, amounting in each plot to over 15 tons per acre. Disease was very slight, and there was a small increase of crop when either dressing was applied, which just paid for the cost.

The above comprise the "medium" varieties. Coming next to the "late" varieties :—

Series 3. "Champion."—There was hardly any disease at all, but the dressings, except in one case, lessened the crop. The sugar admixture was not more beneficial than the other.

Series 10. "Imperator."—Disease occurred, but only to a small extent. The dressings did not lessen disease, but in each case increased the crop well above the cost incurred. The balance was in favour of the later application.

Series 11. "Schoolmaster."—There was only a little disease, which was slightly lessened by the early application. The crop was, however, decidedly heavier on the untreated plot.

Series 12. "Victoria." Here disease occurred, and the dressings succeeded in lessening it, more especially the early dressing, there being only 2·6 per cent. of disease, as against 9·7 per cent. on the untreated plot. The crop also showed a remarkable increase where the dressings were put on, the early one being very successful indeed.

With the "medium" and "late crops" it would appear that the dressings, though successful in reducing the amount of disease wherever it occurred to any marked extent (viz., in "Regent," "White Elephant," and Victoria"), did not in any case prevent it altogether. The early application was decidedly more successful than the later one. There was no case in which the sugar admixture was more efficacious than that without it. As to gain or loss of crop, out of seven cases, there are three of loss and three of gain, while in the seventh ("Regent") gains and losses are balanced. There is only one clear case in which the late dressing has done any *marked* good.

Taking all the varieties—early, medium, and late—together, there are, as the result of the dressings, good paying gains of produce in five cases out of twelve, as against four cases of loss, and three cases where gains and losses about balanced. Further, out of seven cases in which disease occurred, the dressings succeeded in five instances in reducing the amount of disease, while in no case was it increased.

Conclusions.—To sum up these results, the following conclusions may be drawn :—

1. That neither the ordinary *bouillie bordelaise*, nor the *bouillie bordelaise sucrée*, had an entirely *preventive* effect, though both of them, when applied early and before disease appeared, succeeded in lessening the extent to which disease proceeded.

2. That neither dressing when applied after disease appeared had any material effect in *curing* the disease.

3. That the addition of sugar to the ordinary *bouillie bordelaise* did not constitute any advantage, but only added to the expense.

4. That the effect of either dressing upon the weight of produce was uncertain, but tended in the majority of cases to increase rather than to diminish the crop.

5. That, in view of the lessening of disease, and the increase, in the majority of cases, of the crop, the early application of the ordinary *bouillie bordelaise* is to be recommended as a remunerative one.

It must be borne in mind that the past season was one in which disease was not by any means prevalent, and that disease appeared very late in the year. Seeing that the early dressing was most effectual where disease occurred the most, it is a fair deduction that in a season when disease showed itself badly the dressing would give even more favourable results than those now set forth.

J. Augustus Voelcker.

ANNUAL REPORT FOR 1892 OF THE CONSULTING CHEMIST.

The total number of analyses made for members of the Society during the twelve months ending November 30, 1892, has been 1,211, that for the corresponding period of last year having been 1,358.

Although fewer samples have been examined, I am able to say that there has been an improvement in their quality, and that the cases of adulteration which have had to be brought to the notice of the Chemical Committee have been less numerous than in the preceding year.

The sitting of the Departmental Committee, appointed by Mr. Chaplin, when President of the Board of Agriculture in the last Parliament, has probably exercised a beneficial influence, and the Committee's Report will, it is hoped, do much good in securing to the agriculturist the purity of the feeding materials and manures which are supplied to him (see page 852).

Whilst farmers have had bitter reason to complain of the low prices obtainable for stock and grain sold off their farms, they have had no cause of complaint with regard to the prices charged for the ordinary foods and manures used on the farm.

The price of mineral superphosphate has been extraordinarily low throughout. Linseed-cake, from the first, experienced a gradual fall, and costs now (November, 1892) nearly 1*l.* per ton less than it did twelve months ago.

The price of undecorticated cotton-cake has remained much the same all along, whilst the quality of decorticated cotton-cake has decidedly improved, and this valuable feeding material appears to be snapped up as quickly as it can be brought to the country.

Improved machinery for drying brewers' grains has been introduced lately, and this food is now being manufactured on a somewhat extensive scale.

The quality of linseed-cakes is now, on the whole, very satisfactory, and the number of cases in which cakes sold under a guarantee of purity, but which have proved to be inferior, has been but small. On the other hand, it may be truly said of those which are now obliged to be sold under the name "*oil-cake,*" that they have been more than ever mixed with impurities.

No particular new forms of adulteration have been brought to light during the year; but several cases have occurred in which the presence of portions of the husk of castor-oil bean has been discovered in feeding materials. Apropos of this, I may mention a very useful method which was devised in the Laboratory of this Society by Dr. Leather, the late senior assistant, for the rapid separation and detection of this form of adulterant. Reference is made to the method in the Society's Journal, 3rd series, vol. iii. Part iii. (September 30, 1892), page 597, and the method is described at length in *The Analyst*, vol. xvii. No. 195, July 1892, p. 121.

Attention has also been especially called to the frequent occurrence of cotton-wool both in undecorticated and in decorticated cotton-cakes. This has proved objectionable and dangerous in feeding, and I am quite sure that its occurrence in cakes ought to be particularly guarded against.

In addition to the samples which have been examined on behalf of Members of the Society, the Laboratory has been made use of during the year in connection with the Woburn experiments, as also for analyses referring to experiments of Local Agricultural Societies, and for several matters of agricultural investigation.

Linseed Cakes.

Purity of Cakes.—I have recently had considerable correspondence with agricultural bodies and cake manufacturers in foreign countries, more especially in Holland and Denmark, with regard to the possibility of stating the exact percentage of impurity which may occur in linseed and other cakes. I have had to reply that there exists at present no means of directly estimating the quantity of impurity, and I would now point out that the most that can be safely done is to say whether a particular cake contains more or less impurity than one should have which has been made from good seed subsequently well screened. I have previously had occasion to insist that any statement as to "95 per cent. purity" is misleading, and that I could not accept it, inasmuch as it is impossible to determine the exact percentage of impurity, and because it leaves entirely out of account what the nature of the remaining 5 per cent. may be. This latter may be composed of materials directly of an injurious character, the cake, nevertheless, still remaining "95 per cent. pure."

I can, therefore, only admit the term "pure," thereby meaning the state of purity which an honest manufacturer can readily, and, as a matter of fact, does, obtain by using good seed and carefully screening it.

Percentage of Oil.—Another question which has often been brought before me is that of the guarantee of the percentage of oil in linseed-cakes. It is a habit of some manufacturers to guarantee a definite percentage of oil, hoping thereby to increase the sale of cakes of their particular make. To this I have no objection, more especially since a cake rich in oil means, as a rule, one which is soft and in good mechanical condition, as well as high in quality. But, as any one with experience knows, it is impossible to avoid variations, not merely in a whole delivery of cake, but even, within certain limits, in different portions of any one individual cake. Hence, whilst I am by no means in favour of compelling the makers to guarantee the percentage of oil in their cakes, yet, if they will do so, they must be careful not to bind themselves within too close limits, for if a certain percentage is guaranteed, the vendors must be prepared to

see that every piece sent for analysis shall yield the minimum quantity of oil stipulated for.

Again, I would point out that when a guarantee of oil is given, the purchaser should insist not only upon the quantity of oil but also that the oil shall be *pure linseed* oil. In a case which lately came under my notice, a so-called "linseed-cake" contained seeds of *spurrey*, *earth-nut*, *rape*, *cockle*, &c., and the oil obtained from it, although it came up to the guaranteed amount, was very far from being pure *linseed* oil.

Variations in Quality.—As instances of cakes of very different qualities, though sold at very similar prices, I append the following :—

	A	B	C
Moisture	8·85	10·95	9·70
Oil	17·30	7·30	5·46
[1] Albuminous compounds	29·02	29·94	37·25
Mucilage, sugar, and digestible fibre	29·95	36·15	34·69
Woody fibre (cellulose)	8·33	8·96	7·40
Mineral matter (ash)	6·55	6·70	5·50
	100·00	100·00	100·00
[1] containing nitrogen	4·64	4·79	5·96

A. A rich, pure cake, costing, in December 1891, 9*l.* 12*s.* 6*d.* per ton at Bristol, or 10*l.* per ton delivered.

B. A hard-pressed cake, costing, in December 1891, 10*l.* per ton delivered.

C. A hard-pressed cake, sold at Inverness in February 1892, and costing nearly 11*l.* per ton before being delivered.

It will be noticed how very much richer the cake marked A is than either of the others.

Unsound Cakes.—An instance of the danger of using cakes which are in bad condition is afforded by the following case.

In May 1892 a gentleman in Shropshire sent me a sample of linseed-cake, stating that he had lost nineteen sheep, and that the whole of his flock which had had the cake had been very ill.

I found the cake to be not only impure by reason of its containing rape, *polygonum*, and other weed-seeds, but it was mouldy and had a distinctly acid action. In addition, on the surface of the cake were a quantity of long hairs, probably derived from the horse-hair bags in which the seed had been roughly crushed. The certificate of the veterinary surgeon who saw the sheep stated that they had suffered from muco-enteritis, causing dysenteric diarrhœa, from which a large number had died or had to be slaughtered.

Cotton Cakes.

Wool in Cakes.—Reference has already been made to the occurrence of wool in these cakes, due to the seed not having been properly

freed from it. It is very difficult to separate and to estimate the quantity of wool, owing to its close attachment to the husk, but, by passing the cake through a mill and carefully rubbing the husk upon a sieve, a comparative idea may be formed of the relative amounts of wool in different samples. I would illustrate this by the following instances :—

(*a*) A sample of Undecorticated Cotton-cake which appeared to be very "woolly," after being passed through a mill and rubbed on a sieve, was found to have 28·7 per cent. of wool and coarse wool-covered husk, whilst a good cake which had been used in the Woburn Feeding Experiments gave, after similar treatment, only 8·5 per cent. of wool and woolly husk.

(*b*) A Decorticated Cotton-cake which had a woolly appearance was found to contain 2·20 per cent. of wool and woolly husk.

A sample of another cake used in the Woburn Feeding Experiments contained only ·75 per cent. of wool and husk.

In the last named case (Decorticated Cotton-cake) the wool of the bad cake occupied $3\frac{1}{2}$ times the bulk of the wool in the good cake, and it hung together in flocks, whereas that in the good cake consisted almost entirely of fine fibres.

Maize Meal.

Occurrence of Castor Bean.—An important case was brought under my notice, in which a sample of maize meal was found to contain some husk of castor-oil bean.

A number of cows had been taken ill after having had only one feed of the meal. They became severely purged, and went off their milk for about a week. Horses and pigs which had also eaten the meal became ill, but four heifers which had had none remained quite well.

The presence of castor-oil bean was readily detected by the help of the method alluded to earlier in this Report.

Maize Oil-cake.—A new feeding material has been introduced under this name, and samples of it gave the following analyses :—

	No. 1	No. 2
Moisture	8·11	10·50
Oil	9·11	12·50
[1] Albuminous compounds	24·31	25·62
Starch, digestible fibre, &c.	52·90	40·65
Woody fibre (cellulose)	4·27	8·63
Mineral matter (ash)	1·30	2·10
	100·00	100·00

[1] containing nitrogen . . . 3·89 4·10

The price of the meal marked No. 1 was 5*l.* 5*s.* per ton in London.

The figures of analysis read well, and are not at all unlike those of linseed-cake. The meal is, however, wanting in taste, and has the objectionable feature of being distinctly acid.

Dried Grains.

The following are analyses of various samples of this feeding material :—

	A	B	C
Moisture	11·00	9·90	9·67
Oil	7·33	7·10	5·83
[1] Albuminous compounds	17 57	20·16	18·50
Mucilage, sugar, digestible fibre, &c.	44·39	41·29	42·40
Woody fibre	15·66	15·30	18·90
[2] Mineral matter (ash)	4 05	6·35	4·70
	100 00	100·00	100·00
[1] containing nitrogen	2·81	3·22	2·96
[2] including silica	1·85	3·35	2·44

Manures.

As I said earlier, the ordinary artificial manures in use on the farm have been obtainable at very cheap rates throughout the year. This has been especially the case with Mineral Superphosphate of Lime, but also with other articles, as the following analysis will show :—

Dissolved Bones.—A sample of pure Dissolved Bones was sent to me by a Scotch member of the Society, and gave the following results :—

Moisture	13 20
[1] Organic matter and water of combination	27·04
Monobasic phosphate of lime	9 62
equal to tribasic phosphate of lime, rendered soluble by acid	(15 08)
Insoluble phosphates	21·93
Sulphate of lime, alkaline salts, &c.	25·32
Insoluble silicious matter	2·89
	100·00
[1] containing nitrogen	2·96
equal to ammonia	3·59

This was a perfectly genuine sample of Dissolved Bones, and the price of it delivered at the nearest station was, in March 1892, as low as 4*l*. 17*s*. 6*d*. per ton. The manure is, thus, an uncommonly cheap one, and it is a wonder to me that a good manure like this can be sold at so low a price.

Highly-priced Manures.—The inability of farmers, in many cases, to pay high prices for manures has, on the other hand, led them frequently to purchase materials which, though seemingly low-priced, are yet very dear in the end.

I give three instances of this.

(*a*) *Blood Manure.*—A member of the Society sent me a sample of Blood Manure which cost 3*l*. per ton. It was in bad, wet condi-

tion, and, as the following analysis shows, was of low quality and extremely dear.

Moisture	52·75
[1] Organic matter	34·75
Oxide of iron, &c.	4·71
Sand	7·79
	100·00

[1] containing nitrogen . . . . . 1·28
equal to ammonia . . . . . 1·55

(*b*) *Flue Dust.*—A sample of this was sent to me and gave the following results :—

Moisture	22·52
Organic matter	4·37
Carbonate and sulphate of lime	12·21
Oxide of iron, &c.	9·36
Insoluble silicious matter	51·54
	100·00

Such a material has hardly any manurial value at all.

(*c*) *Lecetic Fertilizer.*—This is a material manufactured by the Lecetic Manure Company, Newark-on-Trent, and has been, on more than one occasion, referred to in the Quarterly Reports of the Chemical Committee. It is sold at the price of 3*l.* 10*s.* per ton delivered, but is really little more than impure gypsum, and the price asked for it is an extravagant one. An analysis of it gave the following results :—

Moisture	·85
Sulphate of lime	86 54
Oxide of iron and alumina	1·18
Carbonate of lime	2·22
Alkalies, &c.	2·15
Sand	7·06
	100·00

Miscellaneous Analyses.

River Mud.—It is frequently supposed that materials of this kind have considerable manurial value, but, however useful they may be when close to the spot where they are to be applied, it is seldom that they are worth carting any distance.

A sample of mud from the bottom of a river in Lancashire, and subsequently dried, was sent to me for examination. It was estimated that the cost of the material upon the farm would be 10*s.* per ton after carting it ten miles.

The analysis gave the following results :—

Moisture	11·41
[1] Organic matter	8·01
Oxide of iron, &c.	6·92
Phosphate of lime	·64
Alkalies, &c.	2·58
Sand	70·44
	100 00

[1] containing nitrogen	·11
equal to ammonia	·13

Contrary to the sender's expectation, the dried mud contained very little lime, and was of no use for liming purposes. It had a small amount of phosphate and a little ammonia, but it would certainly not be worth the cost incurred in the cartage, although it was exceptionally dry.

Bird-cage Manure.—A sample of the droppings of cage-birds was sent to me by a member, and gave the following analysis :—

Moisture	11·50
[1] Organic matter	74·70
Phosphate of lime	1·16
Lime, &c.	3·02
Sand	9·62
	100·00

[1] containing nitrogen	3 72
equal to ammonia	4·51

Rape-cake (for manure).—My attention has been specially drawn to the frequent adulteration which takes place in the case of Rape-cake sold for manurial purposes. The English merchants who buy these cakes and sell them again to the farmers find it impossible to obtain any guaranteed analysis from the makers and importers, and it is found that the cakes almost invariably contain a percentage of sand varying from 8 to as much as 27 per cent., and reducing the nitrogen proportionately, thereby affecting very greatly the value of the cake.

From my own experience I can speak as to this being the case, though I cannot altogether agree with the suggestion that has been made, viz., that, in the case of Rape-cakes used for manure, a certain *maximum* of sand should be permitted to exist. If this were done, it would, I fear, amount to a legalisation of admixture up to the allowed point.

In the case of Rape-cakes which are sold for feeding purposes, a guarantee of purity should be given, and purchasers should insist upon having this.

However, as a matter of fact, the use of Rape-cake as a feeding material in this country has almost entirely gone out, and I have no doubt that the difficulty of obtaining it pure has had to do with the

diminution in its sale. But there is a difference in the case of cakes sold for manurial purposes. An admixture of sand or other impurities will certainly affect the value, but it will not, as might be the case with a feeding material, endanger the health of stock. The only satisfactory remedy appears to me to be for the purchasers to insist upon buying manure Rape-cakes according to analysis, and only to pay a price in accordance with the quality of the cakes. This would, I think, be a much better plan than to fix any *percentage* up to which amount admixture will be allowed.

White-lead.

Adulteration of White-lead.—White-lead is an article which is used extensively upon farms and estates, but which is frequently found to be adulterated.

A sample sent to me by a member gave the following analysis :—

Oil	11·23
Sulphate of lead	53·84
Sulphates of baryta and lime	28·83
Oxide of zinc	6·10
	100·00

This was not a genuine White-lead, but contained a considerable admixture of sulphate of baryta and lime, with some zinc compounds, none of which materials should occur in pure White-lead.

Waters.

As usual, a considerable number of samples of water have been included among the analyses done for members of this Society.

Acid Water from a Colliery.—In one instance, when a sample of water was sent to me, it was stated that a heifer which had been drinking of the water of a brook had died. The *post-mortem* indicated the presence of an irritant poison, and traces of free sulphuric acid, as well as an abnormal quantity of iron, were detected in the contents of the stomach. The analysis of the water confirmed these observations, and showed there not only was a great quantity of iron present in the water, but also that the water had a distinctly acid reaction, and contained 2·63 grains per gallon of free sulphuric acid.

On subsequent inquiry it was found that the washings from a colliery or coal-pit ran into the brook two or three hundred yards above the spot where the heifer had been drinking.

I append the list of analyses made in the Laboratory during the past year.

List of Analyses made for Members of the Society, from December 1, 1891, to November 30, 1892.

Linseed-cakes	238
Undecorticated cotton-cakes	76
Decorticated cotton-cakes	42
Compound feeding-cakes and meals	62
Rice-meals	5
Cereals	9
Dried grains	6
Silage and hay	7
Butter, milk, and cream	14
Waters	137
Superphosphates	131
Dissolved bones and compound artificial manures	105
Bones and bone-meals	92
Peruvian guano	10
Fish guano	34
Shoddy	15
Soot	6
Basic slag	36
Sulphate of ammonia	19
Nitrate of soda	42
Potash salts	13
Lime	15
Refuse materials	45
Soils	33
Miscellaneous	19
	1,211
Analyses in connection with the Annual Country Meeting	29
Analyses in connection with the Woburn experiments and those of Local Agricultural Societies	80
Total	1,320

December 6, 1892. J. AUGUSTUS VOELCKER.

ANNUAL REPORT FOR 1892 OF THE CONSULTING BOTANIST.

NUMEROUS instances of injury to plants by parasitic fungi have been investigated during the past year.

Several cases of *canker of larch* have been dealt with, and practical hints given for treatment as recommended by my son, Mr. J. B. Carruthers, in his paper in the Journal (Vol. III., 3rd series, 1891, p. 299). The method of cutting off the cankered sur-

face, and protecting the wound by engrafting wax, was applied to several young trees in a plantation belonging to Lord Moreton, who has reported its complete success.

A serious injury to *tomatoes* grown under glass was found to be caused by the parasitic fungus which produces the potato disease (*Phytophthora infestans*, De Bary). The tomato is a close ally of the potato, and the fungus had previously been observed to attack it. To get rid of the enemy it was necessary to remove the soil and thoroughly cleanse the house. *Bouillie bordelaise* had been applied, but it did not check the progress of the fungus.

Specimens of *gooseberry* were examined which were very much injured by the attack of the fungus called *Æcidium Grossulariæ*, DC. The little cups of the fungus appear on the leaves, stalks, and berries, and are readily recognised by the bright yellow spores with which they are filled when ripe. This fungus is very nearly related to the cluster-cup of the Barberry, which is a stage in the life-history of the parasite that appears afterwards, first as the rust and then as the mildew of wheat. The gooseberry cluster-cup is very irregular in its appearance—some years being too common, and in others very scarce. The other stages of its life-history, corresponding to the rust and mildew of wheat, have not yet been discovered. It is most desirable that the diseased leaves and fruits should be collected as soon as the cluster-cups are observed, and be destroyed by burning. The number of yellow spores produced is enormous; they may find their intermediate host-plant in some unsuspected weed abounding in the garden or in the neighbouring fields or hedges.

Some *vines* under glass were dying from an injury to the inner bark of the roots. On investigation this was found to be due to the attack of a fungus which was living on the inner bark. It existed only in its vegetative state, and my efforts to get it to fruit were unsuccessful. I was consequently unable to determine what species of fungus it was. Its great abundance showed that it could be efficiently got rid of only by a complete change of soil before introducing new plants.

From several localities in the centre of England I had specimens of *finger and toe in turnips.* This injury results from the action of a microscopic organism called *Plasmodiophora Brassicæ*, which attacks the roots of cruciferous plants. When the spore germinates it gives out an amœboid process which penetrates the epidermis of the young root, and, passing into the tissues of the root itself, deforms and modifies it into the state known as "finger and toe." Our correspondent writes that the field from which his specimens were obtained is subject to these attacks, all bulbous plants, except mangel, being affected. The mangel is free because it does not belong to the same family as the turnip. No cabbage, turnip, or other cruciferous plant should be grown in fields subject to this malady. Not only will they be attacked by the Plasmodiophora, but the new crop assists it in keeping possession of the soil. The application of a dressing of the sulphates of potash and ammonia, like that recom-

mended for eel-worm, would, I believe, assist in ridding a field of this destructive organism.

But the most remarkable *fungal attack* was one *affecting the wheat and barley crops* of the East and South of England. My attention was first drawn to it by Mr. Clare Sewell Read. The ears of the affected grain were darkened as if thinly dusted with soot. In sending me the specimens he informed me that a great quantity of the wheat grown in Norfolk was similarly injured. The attack appeared early in August and speedily spread over the wheat-fields. During harvest, at the end of August, the men in binding the wheat were blackened with the spores. Mr. Read says that after pushing his hand into several wet sheaves it looked as if it had been up the chimney. Notwithstanding the spread of the fungus, he informs me that the crop was rather above the average, though the straw was rough and black from the fungus.

The injury was due to the presence of a minute dark-brown fungus called *Scolicotrichum graminis*, Fuckel, which had been figured by Saccardo in his *Fungi Italiani* (t. 927). The densest masses of the fungus occurred in the opening between the tips of the inner glumes ; they were found to be growing on a mass of pollen grains which still filled the cavity above the seed. It was also spread irregularly over the tips of the outer glumes, springing from brown jointed mycelium which was growing on the surface of the glumes, as well as penetrating under the epidermis, and pushing its way through the tissues of the glume. The fruiting stems burst through the epidermis in little tufts arranged in linear series. These stems are simple, jointed, and in the upper portion, where the spores are borne, somewhat irregular. The spores are terminal or lateral on the stem, and are oblong, oval, and uniseptate. This fungus is supposed by some to be the conidial state of *Sphærella recutita*, Cooke. With the view of discovering the other stages of its life I placed its spores, under favourable conditions, on the foliage of cocksfoot and meadow grass, but though eighty sowings were made not a single spore established itself.

The appearance of the crop attacked by this fungus is most unsatisfactory, but the injury done was not serious. This is due to the circumstance that the mycelium does not penetrate the tissues so as to intercept the flow of the food to the seed, as in the case of wheat mildew.

From the description given by Mr. Plowright of a fungus which was very abundant this year in Norfolk, I believe it to be identical with *Scolicotrichum graminis*. He says that where it was present to any extent the reaping-machine was surrounded by a cloud of dust composed of the spores.

Several cases of injuries from *eel-worms* (species of *Tylenchus*) have been forwarded to me. Oats in several districts were injured at the base of the stem, producing the enlargement called "tulip-root." A remarkable case of injury to tomatoes was investigated. Innumerable galls were produced in the roots, so as to arrest their proper growth and destroy their functional activity. Root injuries

in other plants have been investigated by the late Mr. Berkeley and others; but the disease is still imperfectly known, and I propose to make it the subject of a paper for the Journal. In all cases I have urged the use of a dressing of the sulphates of potash and ammonia, as recommended by Mr. Whitehead (Journal, Vol. II., 3rd series, 1891, p. 229), and which was found to be so efficient for the destruction of eel-worms at Rothamsted. The minute size of the worms prevents the cultivator from seeing them in the soil and so discovering the cause of injury. As long as they remain there in any quantity they will be a source of danger to every crop, and as they are remarkably tenacious of life they can only be got rid of by the use of some dressing that has been found to destroy them.

The samples of *cocksfoot* examined had an average germination of 86 per cent. This would have been much better had it not been for a few exceptional samples that grew only 50 per cent. or a little over. The seeds were generally pure, though one sample contained 20 per cent. of other seeds, mostly of worthless grasses and weeds. *Meadow fescue* germinated very satisfactorily, the average being 93 per cent., and was almost without exception free from other seeds. *Tall fescue* germinated 92 per cent, after excluding one sample which was very poor and badly ergoted; otherwise these seeds were clean and good. *Timothy* was pure and free from admixture, and grew rather over 97 per cent. *Meadow grasses* germinated well, but the rough-stalked contained many impurities, one sample having half its bulk made up of chaff and the seeds of inferior grasses. More than a third of the samples of *perennial rye-grass* contained such a quantity of other seeds—chiefly Yorkshire fog and brome grass—as to deteriorate their value. *Italian rye-grass* was more pure and germinated well. *Clovers* were satisfactory as regards germination, but they contained a greater proportion of impurities than were met with in grass seeds. One half of all the clovers had a considerable quantity of weeds; and a twelfth of the samples of red clover contained seeds of dodder, which were also present in Alsike. A sample of *lucerne* had a large quantity of dodder. *Trefoil* was throughout of high quality, and germinated well. The samples of *yarrow* were excellent.

W. CARRUTHERS.

Notes, Communications, and Reviews.

THE FERMENTATIONS OF MILK.

An important memoir "On the Fermentations of Milk" has been issued by the United States Department of Agriculture as Experiment Station Bulletin No. 9 for the current year. In this publication, which extends to seventy-five 8vo pages, Dr. H. W. Conn, Professor of Biology in the Wesleyan University, gives a most useful digest of the original work that has been accomplished up to the present date in connection with this subject. In a bibliographical appendix, which will be hardly less useful to the scientific inquirer than the digest itself to the ordinary reader, Dr. Conn adds a list of 137 original papers, recording the work of different experimenters, but even this professes to be only a selection of the more important references from a much larger list. From this fact, the extreme intricacy of the subject and the great amount of labour that has been expended to give us the very partial knowledge which we at present possess may easily be inferred.

No doubt it is in great measure due to this intricacy that so many loose and inaccurate and, in many cases, absolutely erroneous ideas are current in reference even to the two commonest changes to which milk is subject—souring by keeping and curdling by rennet,—and this not only amongst practical dairymen and farmers, but also amongst contributors to the agricultural press, and those lecturers who have essayed the difficult task of endeavouring to popularise the scientific study of agriculture and dairying in country schools and technical classes.

To these and many others it may be useful if we attempt to gather together in a few pages, and in a readable form, the most valuable and conspicuous fruit of the labours which Dr. Conn has so exhaustively and critically examined for us.

The composition of milk need not detain us long, but must be glanced at in order to make plain what follows, and to facilitate reference to those points which are still matter of controversy. The annexed table, which the writer is accustomed to use for purposes of instruction, may save a longer explanation :—

Average Composition of One Pint of Cow's Milk.

The specific gravity of milk being 1·032, a pint weighs 20 oz. 280 grains, and is made up of—

Per cent.		Oz.	Gr.
87·0	Water	17	419
4·6	Lactose, or Milk Sugar	0	415½
4·0	Casein, an albuminoid substance composed of the elements Carbon, Hydrogen, Oxygen, and Nitrogen, with a little Sulphur and Phosphorus; Lactalbumin, an albuminoid present in smaller quantity	0	361
3·7	Butter Fat, a mixture of several compound fats, which on decomposition yield glycerin together with several fatty and allied acids, the best known of which are Oleic, Palmitic, Myristic, Lauric, Stearic, Capric, Caprylic, Caproic, and Butyric acids	0	334
0·7	Ash, or Mineral Matter, consisting of—		
	Phosphoric Acid . . . 17 grains		
	Chlorine . . . . 10 „		
	Combined with the bases—		
	Lime . . . . . 14½ „		
	Potash . . . . . 12 „		
	Soda . . . . . 7¼ „		
	Magnesia . . . . . 2¼ „		
	Oxide of Iron . . . . trace		
	63	0	63
100·0	Total	20	280

Milk is, of course, a still more complex liquid than the above table shows, and contains small quantities of various substances not mentioned in it (*e.g.* citric acid), but it would be foreign to the purpose of the present paper to enter into more minute details.

The sugar and mineral matters of milk may be looked upon as simply dissolved in the water, but the condition of the fat, casein, and albumin has been the subject of endless discussion.

Changes in the fat appear to take place directly after milking, since some of its ingredients, on which the analyst relies in distinguishing true butter from substitutes like margarine and lard—viz. those compounds which yield butyric, caproic, and caprylic acids—are now shown not to exist in perfectly fresh milk. In this respect milk shows a striking resemblance to blood, which begins to undergo remarkable changes directly it is withdrawn from the veins.

The minute globules of butter-fat floating in milk, familiar to everyone who has looked at a drop through the tube of a microscope, were long thought to be kept from coalescing and solidifying in the milk by a thin albuminous skin surrounding each globule. This skin has never been demonstrated, and belief in it has now been almost abandoned. Babcock has shown that a small amount of a viscous substance resembling the fibrin of blood is formed in milk which has stood a short time, rendering it a little less limpid; and this is believed to assist in keeping the globules asunder, and in hindering

their ascent to the surface. The liquid state of the fat in the globules is simply due to their isolation—a phenomenon familiar to physicists under the name of *superfusion*—and hence, as soon as they have been shaken into coalescence by churning, the fat solidifies because the temperature of the dairy is much below its true melting point.

Most complicated, most mysterious, and most liable to change are the albuminoids of the milk, of which the best known are casein and a smaller quantity of soluble albumin, though others are said to be present by various observers. Even "separated" milk has by no means lost all its opacity, though it has lost nearly all the fat globules to which that opacity is usually ascribed. The residual opacity is by some attributed to the small amount of phosphate of lime present, by others to the condition of some of the casein. Some of this substance is certainly not in the state of true solution, since it is left behind on filtering the milk through a filter of unglazed porcelain; but whether it is present as minute particles, or as a continuous gum or paste—like laundress's starch,—is a moot point. The clear liquid filtering through the porcelain contains that portion of the casein which was in true solution, together with the soluble albumin, which differs little from the serum albumin of blood.

Enough has been said to illustrate the eminently complex nature of milk. But, besides the liability of its ingredients to purely chemical changes, they are precisely of the class best suited to undergo fermentative change, whilst in the albuminoids and mineral salts of the milk are found the most suitable nourishment for microbes of almost all descriptions,—in other words, for the organisms which modern science has recognised as the active agents in exciting and carrying on that class of chemical changes to which the name of fermentations has been given, on account of their general resemblance to the well-known fermentation of sugar into alcohol and carbonic acid by the agency of yeast.

The first and all-important point, which has been made more and more clear as knowledge increased, is that milk drawn from the cow without contamination from outside may be kept indefinitely without further change; in other words, all the known changes to which fresh milk is subject are due directly or indirectly to the action of microbes which gain access to it after it has been withdrawn from the udder.

If the hands of the milker and the teats of the cow be carefully cleansed with acetic acid or other antiseptic, and the milk be drawn direct into sterilised glass vessels which are protected from contact with unfiltered air by cotton-wool plugs, no other precaution is requisite to prevent milk not only from turning sour but also from undergoing any other change. The first successful attempts to obtain *sterile* or keeping milk in this way were made by inserting a sterilised tube direct into the milk duct, but this was soon proved not to be necessary, and many patents have been taken out for obtaining sterile milk direct from the cow with a view to supplying

it in that state on board ship, and under other conditions where fresh milk is not easily obtainable.

It is nevertheless true that to sterilise milk that has been once exposed to the air, by the most ordinary method in use among scientists—namely, heating or boiling,—is by no means easy. In order to succeed, it is necessary to heat the milk not once, as with many other liquids, but several times, and that on successive days. The fact is that the spores of some of the organisms which gain access to milk are not killed by being heated in that liquid even to the boiling temperature. In the intervals of discontinuous heating, however, the spores have time to germinate, and, once germinated, they are easily killed by heat.

A most important corollary from this teaching is that all abnormal conditions of milk may be prevented by care and cleanliness. Instead of imagining something to be wrong with the cow, or with the feeding, when once it is realised that milk goes wrong on account of something which gets into it from outside, the cure will be sought in keeping the surroundings of the cows free from filth, in enforcing absolute cleanliness in the milk pails and dairy vessels, and in refrigerating the milk immediately after it is drawn.

These truths are so well known to our large dairy companies, and are so thoroughly acted on by them, as to make any advice of the sort appear trite and commonplace; but when we think of the multitude of those who are quite in the dark as to the way in which any changes are set up in milk, it cannot be out of place to take any suitable opportunity of putting the gist of the matter plainly before them. We feel justified, therefore, in quoting *in extenso* a few sentences from Dr. Conn in reference to the use of a low temperature in preserving milk from change:—

"To be of most use it should be applied *immediately* after the milk is drawn. When drawn from the cow, milk is at a high temperature, and, indeed, at *just the temperature at which numbers of bacteria grow most rapidly.* Under the influence of the atmospheric temperature, especially in the summer, the milk becomes cool very slowly, but never becomes cooler than the air. The bacteria which have got into the milk will therefore have the very best opportunity for rapid multiplication, and the milk will sour very rapidly. If, however, the milk is cooled to a low temperature immediately after it is drawn, the bacterial growth is checked at once, and will not begin again with much rapidity until the milk has become warmed once more. The warming will take place slowly, and therefore the cooled milk will remain sweet many hours longer than that which is not cooled. It frequently happens from this cause that a milkman finds his morning's milk will sour earlier than the milk of the night before. The milk drawn in the evening is put in a cool place at once, and becomes quite cool during the night, whilst the morning's milk is at once put in cans and taken for delivery. It will thus happen that the older milk will actually keep longer than the newer milk, simply because it has been cooled, and must be warmed again before bacteria can begin to grow very rapidly."

It is well to note that abnormal qualities in the milk which are really due to something in the food consumed—such as the flavours of garlic or turnip—are readily distinguished from *changes* brought about by bacteria by the mere fact that they are most noticeable when the milk is freshest, whereas it is of the essence of bacterial or fermentative change to *commence* some time afterwards, and to attain a maximum more or less gradually.

Let us glance now at some of the best known of the fermentative changes which occur in milk under different circumstances.

The most familiar and universal change is the CURDLING or precipitation of the casein, which invariably occurs on keeping milk exposed to the air. Casein can be precipitated, or caused to take the insoluble form, by a great variety of purely chemical reagents, which, indeed, act on other soluble albuminoids in a similar manner.

Amongst these are the mineral acids and the stronger organic acids, which act simply in virtue of the fact that casein cannot retain the soluble form in presence of an acid, unless the latter be very small in amount.[1] The real caûse of the curdling of sour milk is the production in it of lactic acid in sufficient quantity, and this acid is produced by transformation of the milk sugar contained in the milk. Milk sugar, indeed, has the same percentages of the elements carbon, hydrogen, and oxygen as lactic acid, so that the transformation is purely a molecular one. That this transformation is effected by the growth of a bacterium in the milk has been long admitted, also that the multiplication of the bacteria continues until the lactic acid produced is sufficient in quantity to act as an antiseptic and prevent their further growth. In the same way we see some specimens of silage produced so rich in lactic and perhaps other acids as to resist the growth of the common mildews or moulds, even though kept exposed to the air.

The first experimenter to obtain a pure cultivation of an organism producing a lactic fermentation in milk was Sir Joseph Lister, who in 1873 isolated and studied a bacterium which he called *Bacterium lactis*. This organism he found to be common around the dairy, but not anywhere else, even in the barn. Hence the rather surprising result that sterilised milk exposed to the air, in any place away from a dairy, will not turn sour or usually curdle, although it will eventually undergo some other form of fermentation. The fact that ordinary milk will turn sour wherever it is kept is therefore a consequence of the lactic bacterium inevitably gaining access to it before it leaves the dairy.

But it was soon to be shown that Lister's bacterium is not the only one having the power of forming lactic acid from milk sugar. Hueppe in 1884 made a thorough study of a bacterium which he found to be the most common one in milk, called by him *Bacterium*

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[1] According to recent experiments, milk containing as little as two parts of lactic acid in a thousand will curdle on being boiled; it often acquires as much as this ten hours after milking.

acidi lactici, and apparently agreeing with that previously described by Lister. This organism produces no spores, and is consequently destroyed by a moderate temperature, heating the milk to 158° F. on five successive days being sufficient for this purpose. It grows best at a temperature of 95 deg. to 108 deg. F., and normally curdles sterilised milk in twenty-three to twenty-four hours, producing lactic acid and *carbonic acid.* Hence this species effects more than a simple molecular change in the sugar.

Hueppe himself found five other species of organisms in milk, all capable of rendering it acid and curdling it. Others have amply confirmed this, and Flugge in 1886 mentions no less than sixteen species which have the same power. Many additional ones have since been isolated, and now we regard the property as that of a class of microbes rather than of an individual. Even in the dairy it seems that it is not always the same species that sours milk. The *B. acidi lactici* of Hueppe has certainly been found in many specimens of milk in Europe, though by no means universally. The lactic organism common at Wiesbaden is different from the form common in Gröningen, one being a bacillus and the other a coccus. In America no one has definitely found Hueppe's bacillus, and the common one is quite distinct from it, whilst other different ones have been found.

In some cases other acids than lactic (acetic and formic) have been found accompanying it, and the quantity of acid formed by different organisms has been ascertained by Warington to be very variable. In fact, many of the acid-forming species do not form enough acid to precipitate the casein (Conn). Nencki, only last year, described two bacteria apparently identical in every respect except that they produce chemically different varieties of lactic acid by their action on milk sugar. And Grotenfelt has proved that the *B. acidi lactici* itself loses its power of producing lactic acid if cultivated for a long time in a sugar-free medium, though in other respects it remains unaltered.

The next most familiar milk fermentation is the CURDLING BY THE ACTION OF RENNET, which has been found from time immemorial to be the best suited to cheese-making. Ordinary dairy rennet is an acid liquid, and hence perhaps the common error of attributing its curdling power to the presence of an acid. That this is not the case is at once proved by the fact that rennet will curdle milk which is kept neutral or even slightly alkaline. Another common error is that rennet being derived from a stomach acts by virtue of the *pepsin*, or common digestive ferment always found in gastric juice. As long ago as 1870 Hammersten showed that pure pepsin has no power to curdle milk. The curd produced by an acid, besides being different in texture from that produced by rennet, can be shown by a striking experiment, due to Hammersten, to be different in its mode of production. If the curd produced by an acid be dissolved in weak alkali, the solution carefully neutralised, and an acid again added, the curd is again precipitated, and so on indefinitely. But

the neutral solution of the curd cannot be curdled at all by addition of rennet. Something is necessary to this kind of curdling which was present in the milk and is not present in the precipitated curd. This is proved by adding the whey to the neutral solution of the curd, when it becomes precipitable by rennet, like fresh milk. The necessary substance appears to be the very small amount of lime compounds present in milk and in rennet curd but not present in acid curd.

The active principle in rennet is considered by all authorities to be a *chemical ferment*, which has been variously called lab, chymosin, pixine, and rennet diastase. This last name is in allusion to the diastase of malt, the earliest and best known of the class of chemical ferments, which has for its special function the transformation of the starch of malt into sugar and dextrin.

These chemical ferments are readily distinguished from the organised or living ferments. They are easily soluble in water, and their solutions can be filtered through so fine a material as unglazed porcelain without losing their fermentative power, whereas bacteria and other living ferments cannot pass through such a filter. Moreover, a definite quantity of a chemical ferment will do only a definite, although very large, amount of work, whereas a single bacterium is capable of transforming any quantity of fermentable substance, because it is capable of indefinite multiplication.

There is, however, an intimate relation between the living ferments and the chemical ferments, or, as they are called, *enzymes*. The enzymes themselves are products of the growth of living organisms, bacterial or other. In fact, it is a general rule that the cultivation of a species of organised ferment is accompanied by the production of at least one definite chemical ferment, and it is sometimes a matter of difficulty to determine whether a given change is due to bacteria themselves or to the enzymes which they produce. In the case of rennet it is very probable that the rennet ferment proper is produced by the multiplication of bacteria during the time the vells are hung up in the air as well as during the period of their maceration in brine. The alcoholic preparations known as essences of rennet contain the ferment in a stronger and purer condition than ordinary dairy rennet, and by precipitation of these with more alcohol and drying at a low temperature Duclaux has even succeeded in making a dry or solid rennet extract, but the pure ferment itself has never been isolated. It is estimated by Duclaux that one part of the pure ferment would coagulate as much as 800,000 parts of casein. The exact manner of its action is not fully made out, but according to the most probable account it acts on the caseinogen (the substance in the milk from which casein is produced by curdling), breaking it up into two albuminoids, one of which is easily curdled, whilst the other is curdled only with great difficulty. The former is readily precipitated from its solution by calcium salts ; and since these are always present in the milk, the result of rennet action is always to throw down the curd. The other portion of the original caseinogen, being soluble, goes into the whey and is lost to the cheese-maker.

The rennet ferment has been found in other places besides the stomach of mammals. Roberts has found it in birds, Benger in fishes, and other observers in a variety of plants. Duclaux and others have found it produced by the growth of many bacteria.

Before turning to some of the minor fermentations of milk, it will be well to get an idea of the number of bacteria to be found in it under various circumstances. In the udder it contains none: it is possible to withdraw the milk into a vessel still containing none. On the other hand, it has sometimes been found to contain a million and a half in a cubic inch only a few minutes after milking. Six hours afterwards there *may* be sixty times this quantity. Whatever be the number to start with, the temperature at which the milk is kept will have an enormous influence on the rate of multiplication.

In a sample of milk kept at 60 deg. F. there was no perceptible increase in the bacteria on one hour's standing; in the same sample kept at 95 deg. the increase was 7½-fold. On standing six hours at the two temperatures the bacteria had increased 435 times and 3,800 times respectively. The souring of milk so frequently observed during a thunderstorm is attributed, as the result of the experiments that have been made on the subject, not to any direct electrical influence, but simply to the sultry atmosphere which generally precedes a thunderstorm favouring the rapid multiplication of bacteria. It is found that milk properly refrigerated or kept surrounded by cold water does not sour any more quickly during a thunderstorm.

Butyric acid fermentation is sometimes set up in milk, giving it the odour of rancid butter. The butyric acid is, however, produced from a different source and by different means in the two cases. In milk it is the sugar which undergoes this butyric fermentation, under the influence of quite a number of different microbes. Most of them agree amongst themselves and differ from the lactic ferments in growing best in the absence of air or oxygen—that is, they are anaërobic microbes. In other respects they differ much one from another. Some render the milk acid, and some alkaline; some produce gas, and some do not, and the by-products differ in different cases. One of the best known of them, the *Bacillus butyricus* of Prazmowski, produces spores that are not killed in boiling milk, and hence the fact that milk once boiled in a plugged flask generally develops butyric acid after a time, although the lactic fermentation and consequent curdling have been prevented.

The production of butyric acid in rancid butter is quite a different matter. Here the source is the butyrin[1] of the butter fat, which gradually splits up into butyric acid and glycerin from causes which seem to have nothing to do with bacterial growth. Butter fat does not turn rancid if kept from the air. If sterilised butter

[1] Or, at any rate, the mixed glycerides of butyric acid, since many chemists deny that butyrin in a separate state exists in butter fat.

fat be inoculated with rancid fat in which many bacteria may be present it does not become rancid. The best authorities agree that the development of rancidity is a purely chemical process, promoted by light and requiring the presence of air. It is nevertheless held that rancidity is promoted by the presence of lactic acid, and possibly hastened indirectly by the growth of microbes.

BITTER MILK, a not very infrequent product, is sometimes associated with the butyric fermentation of the milk sugar, whilst sometimes it has a different origin. It is true that boiled milk or other milk which undergoes the butyric fermentation generally turns bitter at the same time; but it is a question whether the bitterness is caused by the same organism which produces the butyric acid. Two years ago Weigmann found in bitter milk an organism which produced the bitter taste without any butyric acid, but still more recently Conn has isolated from an intensely bitter sample of cream, and made pure cultures of, a micrococcus which rendered the milk very acid and very bitter, at the same time producing butyric acid. So it would seem that both cases occur. As regards the bitter substance itself, it may in the milder cases be peptone or the soluble and diffusible albuminoid produced by the action of the microbes on some of the casein of the milk. But in those cases where the taste is intensely bitter, it is more likely that a specific bitter principle is produced as an alteration product of a little of the casein.

"BLUE MILK" is, or at any rate used to be, a comparatively common trouble, sometimes in isolated dairies and sometimes spreading through a locality like an epidemic. Of course we do not allude to what used to be called (before the Adulteration Act days) "London sky blue," but to the intensely blue colour which occasionally invades genuine milk, appearing at first in spots. This was the first change in milk which was recognised as due to the invasion of an organism, Fuchs having fifty years ago described the organism causing it, and proved that the growth of the organism and consequent blueing of the milk could be prevented by the use of antiseptics. Modern experimenters have amply confirmed this result. Hueppe, in particular, has isolated and made pure cultures of the specific organism, which is called *Bacillus cyanogenus*, and rapidly gives rise to the blue patches when inoculated into any ordinary sample of milk. It is curious that when inoculated into sterilised milk, although the bacillus grows well enough, it produces only a greyish colour, but if a little lactic acid be added this colour turns bright blue. Lactic acid is therefore necessary to the formation of the blue colour, and as some lactic organism or other is always present in unsterilised milk, this condition is never lacking.

Blue milk does not appear to be injurious to animals. Blue cheese (not, of course, the ordinary blue mould of cheese) has been attributed to the same cause as blue milk.

Other pigment-producing organisms are quite capable of growing

in milk, and occasionally invade it. Two species of bacillus are known which turn milk violet, several which turn it yellow, and some which produce a green colour. A large number of organisms have been described which turn milk various shades of red, some curdling it and some not. In addition to these the well-known *Micrococcus prodigiosus*, the cause of "bloody snow" and "bloody bread," occasionally grows on the surface of milk or cream, producing bright-red spots.

SLIMY, VISCOUS, OR ROPY MILK is not uncommonly met with. The popular explanation of this, as arising from food eaten by the cows, is superseded by the discovery by various observers of no less than eighteen distinct organisms which, when inoculated into milk, render it more or less viscous. About half of these have been isolated from milk itself, the others from various sources, such as cheese, wine, beer-wort, water, inflamed udders, &c. The viscosity produced varies from a slight thickening to a solidification which allows the vessel of milk to be inverted without spilling its contents. In some cases so tenacious is the mass that it can be drawn into threads many feet in length. The slimy substance is no doubt different in different cases, and the by-products of the various fermentations also are very various. A viscous fermentation, similar to some of those that can be set up in milk, is known to occur rather frequently in wine and beer.

In at least two instances viscous milk is turned to useful account, and these varieties may be considered normal products. In Norway, Sweden, and Lapland the people produce slimy milk as an article of diet. This they sometimes do by feeding the cows with the little plant[1] called *Pinguicula vulgaris*, but the true rationale of the process becomes apparent when we are told that they effect the same object by rubbing the milk vessels with this plant or by immersing it in the milk. When a taint is communicated to milk by a particular food it is generally due to the fact of the milkers handling the food in feeding the cows, and not to the fact of the cows eating it. A familiar instance of this is furnished by silage, which earned a bad name as a food for milch cows before the proper

[1] The Common Butterwort (*Pinguicula vulgaris*, L.) is a native British plant. It grows in wet or boggy situations, and is fairly common in the western hilly districts of England, Scotland, and Ireland, but is rarer in other parts of the kingdom. It has a rosette of spreading leaves, of a light-green colour, somewhat succulent in texture, and presenting a wet, clammy appearance. The flower stalks are 4 to 6 inches high, and each bears a solitary flower, two-lipped, bluish-purple, and spurred. The plant is in flower from April or May to July, and its fruit is a capsule, as shown on the left-hand side of the illustration (p. 806). It is a perennial. The name Pinguicula is derived from the Latin *pinguis*, in allusion to the *greasy* texture of the plant. There are two or three other native species of Pinguicula, including the Alpine Butterwort (*P. alpina*, L.) and the Pale Butterwort (*P. lusitanica*, L.); and these, with three or four species of Bladderwort (Utricularia), make up the small natural order Lentibularineæ, the nearest affinities of which are with the primrose and foxglove families.—ED.

method of feeding it to them was discovered, after which no further trouble was experienced. In the case of the Pinguicula, confirmation is afforded by the fact that Weigmann has isolated from the slimy milk produced by it an organism which produces the observed effect, rendering milk into which it is inoculated slimy in ten to fifteen hours at an optimum temperature of 86 deg. to 104 deg. F. Slimy milk is also used in the manufacture of Edam cheese, and Weigmann has isolated from the whey of this cheese the same coccus which he finds in the Norwegian slimy milk.


The Common Butterwort,
Pinguicula vulgaris, L.

The ALCOHOLIC FERMENTATION OF MILK is one that cannot well be omitted in a review of this kind. It is not a fermentation that cows' milk readily undergoes, and is hardly, if at all, known as a dairy trouble. In fact, if the yeast of beer or wine is added to milk, it usually sets up the lactic fermentation, doubtless because nearly all commercial yeast is contaminated by one or another lactic ferment. That the sugar of milk can under suitable circumstances be converted into alcohol is nevertheless a familiar fact from the existence of at least two alcoholic liquors that owe their properties to this change. One of these is koumiss, which, as prepared by Tartar tribes, is made from mares' milk. The ferment used by them is a little previously made koumiss, or even a little sour milk, and as these substances, if added to cows' milk, would merely curdle it, we must conclude that the sugar of mares' milk, if identical with that of cows' milk, is at any rate more susceptible of the alcoholic fermentation than the latter. The casein in the mares' milk is not found to be curdled or precipitated in the fermented koumiss, but is converted into soluble and more digestible forms. This has led to the manufacture of an imitation of koumiss from cows' milk as an invalid's beverage, and in this case the milk is induced to enter upon the alcoholic fermentation by the addition of a little common sugar, which, it is well known, easily yields alcohol when fermented with yeast. If properly managed the milk sugar will then also undergo conversion into alcohol, and the casein, although at first precipitated, will be afterwards dissolved, and its digestion facilitated as in genuine koumiss.

The other alcoholic milk beverage is made from cows' milk. It is the "kefir" of the Caucasus, made in leather flasks by placing in the milk some "kefir grains." These curious grains not only start the fermentation, but grow in size during the process, after which they are taken out, dried, and kept for future use. They will keep for years with their power undiminished. A number of different species of microbes have been found in kefir grains by various

workers, and their properties studied; amongst them there appears to be at least one true yeast (*Saccharomyces*) having the power to ferment milk sugar into alcohol. It seems probable that the yeasts which produce this change do so by first producing a soluble ferment (enzyme) by their growth, which has power to *invert* or change the milk sugar into a sugar fermentable into alcohol. It is well known that common yeast acts in this way upon common cane sugar, inverting it by action of a soluble ferment (invertase) before fermenting it.

Amongst the MILK FERMENTS which the researches of recent years have made us acquainted with are many which have the power of curdling milk without rendering it acid, some of them, on the other hand, actually rendering it slightly alkaline. Numbers of species which do this have been studied by Duclaux, who has given to a large class of them the generic name *Tyrothrix*. They are considered to curdle milk by producing a soluble ferment or enzyme resembling the active principle of rennet, and as a matter of fact the clear liquid obtained by filtering a culture of these bacteria through biscuit ware will curdle milk, though no bacteria are present in it, as they have been removed by the filtration. Not only so, but in many cases such a solution contains a second enzyme, which dissolves or digests the curd more or less slowly after it has been formed. Warington has made the generalisation that all the bacteria which possess the double power of first curdling milk, and then dissolving the curd, are of the class which liquefy gelatine when grown upon it, and this conclusion has been confirmed by Duclaux. It seems likely that all the gelatine-liquefying bacteria have the property of digesting casein, and it is further probable that they do this in order to prepare it for their own nourishment.

These digestive bacteria, if so they may be called, are of great importance in the RIPENING OF CHEESE. Speaking very generally, it may be said that cheeses are ripened by simultaneous processes of two distinct kinds. On every crack and cranny exposed to access of air grows one or another, perhaps several, species of mould, torula, bacillus, or bacterium. By directly feeding upon and altering the casein these organisms produce a small quantity of strongly tasting and strongly smelling decomposition products of casein, which, like a pinch of spice, communicate a pungent flavour to the whole body of cheese. At the same time some of these microbes secrete or produce enzymes which gradually diffuse through the substance of the cheese from the outside to the centre, softening, peptonising, or partially digesting the hard and tasteless curd as they penetrate through the mass. Into a detailed account of the chemistry of cheese ripening we cannot now enter; it would require another article at least as long as this to give an account of what has already been made clear about the maturing of different varieties of cheese.

One point which certainly has a direct practical bearing on dairy work may serve to conclude this imperfect sketch of milk fermentations.

Butter of finest aroma, "gilt-edged butter," as it is sometimes called in butter-making competitions, can only be produced, according to the opinion of competent judges, by ripening the cream before churning to exactly the right point, and by exercising great discretion as to the amount of washing to which the granulated butter is subjected in the churn. In fact, on this point the requisite condition for fine flavour clashes with that for keeping quality, since for the latter the fresher the cream and the more the butter is washed the better. Now the aroma which is communicated to the butter during the ripening of the cream is, in all probability, if not demonstrably, due to the growth of suitable microbes in the cream during this stage. Storch and Weigmann have independently succeeded in isolating from ripening cream an organism which communicates the desired aroma to fresh cream when inoculated into it. Dr. Conn tells us that pure cultures of this ferment are coming into use in butter factories in Germany as a means of correctly ripening fresh cream with ease and certainty. Should such a proceeding be found generally practicable, it may certainly be expected to add to the keeping qualities of butter without detriment to the greatest refinement of flavour.

A point not alluded to by Dr. Conn is the formation in milk and cheese, under peculiar conditions, of a violent poison, which has received the name of *tyrotoxicon*. The many recorded cases of poisoning by eating cheese in which no suspicion of adulteration or foul play existed remained unexplained until this substance was discovered in a sample of poisonous cheese. It can easily be extracted and even crystallised; in one case 7 or 8 grains of the substance was extracted from about 30 lb. of poisonous cheese. Milk kept in a corked bottle, half-full, for two or three months is known to develop the same poison. It is clearly a result of some fermentation, the exact nature of which is not made out. The organisms producing this and similar poisons are the microbes of *putrefaction*, many of them anaërobic, and under normal conditions they do not obtain a footing.

J. M. H. Munro.

THE GROWTH OF VETERINARY PATHOLOGY.[1]

Within the last twenty years veterinary science has made greater strides than it did during the preceding eighty. Every branch of veterinary knowledge has shared in this advance, but in none has the progress been so rapid as in the domain of Pathology. Patho-

[1] Extracts from the Inaugural Address delivered at the Royal Veterinary College, October 5, 1892, by Professor McFadyean, B.Sc., M.B., &c.

logical research has discovered new diseases, has revolutionised the views formerly held regarding many others, and is now pointing the way to methods of cure and prevention that were scarcely dreamt of two decades ago.

As a first illustration we may take TUBERCULOSIS. Twenty years ago this disease was generally ascribed to some mysterious quality of the tissues—a quality peculiar to certain breeds and individuals, and one in consequence of which almost any irritant, such as would in other individuals excite merely a passing inflammation, might serve to light up a destructive process, capable of spreading throughout the whole body. That it was contagious or infectious was not generally admitted by veterinary surgeons, in this country at any rate, but it was believed that it might be generated in various ways, such as by close breeding, exposure, or improper feeding. At the present day, on the other hand, we have no need to speculate regarding the cause of tuberculosis. It has been proved, beyond the possibility of doubt, that tuberculosis is caused by the introduction into the system of a minute vegetable parasite or germ, and the disease has now to be classed with the contagious maladies. We know further that tuberculosis is identical with the disease termed consumption in the human subject, and we have to reckon with the possibility of the disease being transmitted between ourselves and our domesticated animals.

ANTHRAX affords another example of the revolution that has been effected in our notions regarding the cause of important diseases. In text-books published less than twenty years ago anthrax is vaguely described as a disease in which "there is a sudden change in the physical characters and physiological properties of the blood." It was believed that it originated spontaneously, and that geographical, climatic, and dietetic conditions played an important *rôle* in its production. Furthermore, it was regarded as a disease that assumed many forms, the two commonest in cattle being splenic fever and black-quarter.

Every one of these notions has had to be discarded. Anthrax, like tuberculosis, is now known to be a disease that owns but one cause, viz. the entrance into the body of a vegetable organism—the anthrax bacillus. The so-called black-quarter, once regarded as a mere variety or modified form of anthrax, is now known to be a perfectly distinct disease, caused by another bacillus, which, broadly speaking, is as different from the anthrax bacillus as a sheep is from a goat.

GLANDERS, again, is a disease regarding the cause of which we have acquired further assurance only within the last few years. It, too, was formerly regarded as a disease that had various causes, and that sometimes originated spontaneously, but it is now known that every case of glanders is due to infection with a germ derived from some antecedent case of the disease.

But, perhaps, the disease regarding whose nature and cause the most complete change of opinion has been effected within the last few years is TETANUS or LOCK-JAW—a disease which, from the suffering that it causes, and from its great fatality, ranks as one of the

most terrible maladies common to man and the lower animals. In books published twenty years ago there cannot be found the least suggestion that the disease might be due to a germ, and yet we know to-day that the locking of the jaw from which the disease derives its popular name is due to the action of a deadly poison manufactured in the wound by a bacillus.

As another illustration let us take a well-known disease peculiar to the horse, and known as STRANGLES. This is a disease in which there forms about the horse's throat, and sometimes in other parts of his body, collections of pus or matter, and if anyone will refer to text-books published only a few years ago he will find the most varied views—all of them wrong—regarding the cause of the suppuration. It is long since it was known that the matter which forms in strangles is mainly composed of small elements derived from the blood, and named pus-cells, but until quite recently the most important element in the pus was overlooked, viz. a minute organism growing in the form of a miniature necklace, and now termed the streptococcus of strangles. Every case of strangles is caused by growth and multiplication of this germ, first in the horse's nose, and then in the deeper parts to which it is able to penetrate.

It was stated at the outset that pathological research has discovered new diseases within the last twenty years, and an example is afforded in ACTINOMYCOSIS. It is only sixteen years since this name was coined in Germany to mark a disease which subsequent experience has shown to be by no means uncommon in various parts of our own country. It is a new disease only in the sense that it was formerly confounded with other perfectly distinct affections, chiefly cancer and tuberculosis. We now define this disease as one caused by a vegetable parasite called from its mode of growth the actinomyces or ray-fungus, and by the presence of this fungus in the diseased parts we can easily distinguish between this affection and tuberculosis.

These illustrations may convey some idea of the rate at which knowledge has been extended regarding the nature and cause of diseases, and it may now be asked whether there has been like progress with reference to the means of curing and preventing these diseases. It is a truism that the discovery of the cause of a disease is the first step towards the discovery of the means of cure or prevention, but it has perhaps to be confessed that the discovery of remedies often lags a long way behind the discovery of causes. Still, magnificent results have already been achieved in the case of some diseases. Take, for instance, the Pasteurian method of protecting animals against anthrax by means of attenuated culture of the anthrax bacillus,—a method which, during the last 10 years, has annually saved many thousands of pounds to stock-owners in France. Similar methods have been applied with more or less success in the case of several other diseases, but at the present moment we appear to be on the threshold of still greater discoveries regarding the means of combating diseases that have hitherto defied every therapeutic effort. It has recently been shown that it is possible to

protect even horses against lock-jaw by the use of what is termed a chemical vaccine, and the blood-serum of horses thus protected has been found capable of conferring immunity when injected into other animals. But, what is still more remarkable, and pregnant with promise of the most beneficial results to both man and the lower animals, it has been discovered that the blood-serum of horses thus artificially rendered immune against lock-jaw is actually curative when injected into animals affected with tetanus.

Even, however, when the discovery of the cause of disease has not yet been followed by the discovery of anything of the nature of a protective or curative vaccine, our position to-day is infinitely better than it was formerly. Take, for example, the case of tuberculosis. It is a melancholy truth that we know of no certain cure for that disease, and no means of vaccinating against it; but the discovery of Koch's bacillus and the study of its life-history have given us clear notions regarding the manner in which the disease is spread, and have indicated the way to limit its ravages—possibly even to stamp it out of existence.

It would hardly be right to conclude without making reference to an event which is likely to exercise an important influence on the teaching and study of veterinary pathology in this country, namely, the founding of a Chair of Comparative Pathology in the Royal Veterinary College by the Royal Agricultural Society of England. The study of veterinary pathology is deserving of every encouragement, because it arms us for the struggle with the diseases of the domesticated animals. But there is an additional incentive in the reflection that a more accurate knowledge regarding animal diseases is sure to shed a fuller light on the nature of certain affections of man himself. All honour is therefore due to the Royal Agricultural Society for its foresight in encouraging the study of this important branch of medical science, and for doing what in nearly every other civilised country has been accepted as a duty of the State.

J. McFadyean.

THE DECLINE OF WHEAT-GROWING IN ENGLAND.

To what extent it is true that England is ceasing to be a wheat-growing country is a circumstance that can best be ascertained by a careful study of the Agricultural Returns issued by the Board of Agriculture. These afford the means not only of determining what shrinkage has taken place in the aggregate wheat area of the country, but also of localising to a very considerable degree the districts wherein fluctuations of the wheat area are most apparent.

At the outset it may be well to emphasise the fact that though an inquiry of this kind may be usefully extended so as to embrace the whole of the United Kingdom (including the Isle of Man and

the Channel Islands), it yet, in effect, narrows itself down, especially at the present time, to a discussion of the distribution of the wheat area within the limits of England alone. That this is so will become apparent from an examination of Table I., wherein is shown

TABLE I.—*Total Acreage of Wheat in England and the United Kingdom.*

Year	England	Wales, Scotland, Ireland, &c.	United Kingdom
	acres	acres	acres
1871–75 average .	3,284,445	452,695	3,737,140
1876–80 average .	2,863,287	326,799	3,190,086
1881 . . .	2,641,045	326,014	2,967,059
1882 . . .	2,829,491	334,408	3,163,899
1883 . . .	2,466,596	246,686	2,713,282
1884 . . .	2,530,711	219,877	2,750,588
1885 . . .	2,349,305	203,787	2,553,092
1886 . . .	2,161,126	196,768	2,357,894
1887 . . .	2,197,580	189,938	2,387,518
1888 . . .	2,418,674	249,552	2,668,226
1889 . . .	2,321,504	233,045	2,544,549
1890 . . .	2,255,694	227,901	2,483,595
1891 . . .	2,192,393	199,852	2,392,245
1892 . . .	2,102,969	195,638	2,298,607

the acreage of wheat in England alone, the aggregate acreage in all other parts of the United Kingdom, and the total acreage of the United Kingdom, for each of the years specified. In the first line of figures are seen the average annual acreages for each of the five years 1871 to 1875 inclusive, and in the second line similar averages for the five years 1876 to 1880 inclusive. Then follow the actual acreages for each of the twelve years 1881 to 1892. The area devoted to wheat in Wales, Scotland, Ireland, &c., is seen to be only a small fraction of the area in England. In recent years, moreover, the disparity has been increasing, for it is calculable from the figures in Table I. that England—

In 1871–75 had 87·89 per cent. of the wheat acreage of United Kingdom.
„ 1876–80 „ 89·76 „ „ „ „ „
„ 1882 „ 89·43 „ „ „ „ „
„ 1892 „ 91·49 „ „ „ „ „

Table I. further shows that whereas, in the early seventies, the wheat area of England averaged 3,284,445 acres, in 1892 it had fallen to 2,102,969 acres. During the last twenty years, therefore, the wheat area of England has shrunk one-third.

In the Agricultural Returns for 1890 Major Craigie gave a statement showing the acreage of wheat in England in 1870, 1880, and 1890, and the proportion which these acreages respectively bore to the total cultivated area of England. This statement is extended in Table II., on the next page, so as to include the present year.

TABLE II.—*Area under Wheat in England in* 1870, 1880, 1890, *and* 1892.

Year	Acres	Proportion per 1,000 acres of cultivated land
1870	3,247,973	139
1880	2,745,733	112
1890	2,255,694	90
1892	2,102,969	84

From this it is apparent that whereas in 1870 wheat occupied about 14 per cent. of the cultivated land of England, the proportion had fallen in 1880 to 11 per cent., in 1890 to 9 per cent., and in 1892 to less than $8\frac{1}{2}$ per cent.

Reverting to Table I. it is seen that, in the twelve years 1881 to 1892, the largest wheat area was that of 1882 and the smallest was that of 1892. These two years, therefore, at an interval of ten years apart, will afford convenient data for determining the changes in the wheat area which have taken place during the last decade. At the same time, as bringing to the front the latest ascertainable facts upon the subject, it appears to be desirable to investigate the nature and extent of the changes which took place during the wheat year of 1891–92.

TABLE III.—*The Wheat Areas of the United Kingdom.*

—	1892	1891	Increase (+) or decrease (−) in 1892	*Decrease* in 1892 compared with 1882
	acres	acres	acres	acres
England . . .	2,102,969	2,192,393	−89,424	726,522
Wales . . .	55,278	61,590	− 6,312	40,109
England and Wales	2,158,247	2,253,983	−95,736	766,631
Scotland . . .	61,592	53,294	+ 8,298	17,490
Great Britain .	2,219,839	2,307,277	−87,438	784,121
Ireland . . .	75,344	81,394	− 6,050	77,480
United Kingdom (including Isle of Man and Channel Islands)	2,298,607	2,392,245	−93,638	865,292

Table III. records the areas under wheat in England, Wales, Scotland, Ireland, and the United Kingdom in the years 1891 and 1892. It is instructive to note that, as is shown in the third column of figures, whilst in the latter year England and Wales suffered an area of 95,736 acres—approximately equal to that of our smallest county of Rutland—to fall out of wheat cultivation, Scotland with its colder climate and shorter summer increased its wheat area by 8,298 acres,[1] representing an advance of 15 per cent.

[1] Five Eastern counties alone contributed two-thirds of this increase. These were: Fife, with an increase of 1,810 acres; Haddington, 1,419 acres; Forfar, 1,241 acres; Edinburgh, 891 acres; and Berwick, 629 acres; the total of these being 5,990 acres. No other county shows an increase of area equal even to that of Berwick.

upon its wheat acreage of 1891; this may possibly have been due to a finer autumn, favourable to wheat sowing, north of the Tweed. The result of the decennial comparison, as given in the last column, indicates that in England alone there has passed out of wheat cultivation since 1882 an area of 726,522 acres, which is nearly as much as the entire area of the county of Stafford, and considerably more than the area of either Chester, Derby, Durham, or Northampton. But, as appears in Table IV., this decline of 25·6 per cent. in the

TABLE IV.—*The Wheat Areas of England and the United Kingdom at an Interval of ten Years,* 1882 *and* 1892.

—	England	Wales, Scotland, Ireland, &c.	United Kingdom
	acres	acres	acres
1882 . . .	2,829,491	334,408	3,163,899
1892 . . .	2,102,969	195,638	2,298,607
Decline in 1892 .	726,522 = 25·6 per cent.	138,770 = 41·5 per cent.	865,292 = 27·3 per cent.

wheat acreage of England was accompanied by a decline of 41·5 per cent. in the other sections of the United Kingdom.

Coming now to the special object of this inquiry—the shifting of the wheat area in England—Table V. has been constructed to show the acreage of wheat in each county of England in 1892 and 1891, and the increase or decrease in 1892 compared with 1891. The figures in the last column of this Table show the decrease in each county in 1892 as compared with 1882. The total area of each county—which it may be observed is always greater, and in some counties considerably greater, than the cultivated area—is stated in the first column of figures in order to afford some guide as to the extent to which wheat cultivation is practised in the respective counties. Hertford, with its 56,904 acres of wheat, has a greater proportion of its area under this crop than Hants with its larger area of 76,257 acres of wheat, and other similar cases may be picked out.

How very general was the shrinkage in the wheat area of the counties of England in 1892 is shown by the frequency of occurrence of the *minus* sign in the fourth column of figures in Table V. With four exceptions every county in England seeded less land to wheat in 1891–92 than in 1890–91. Saving Westmoreland, the county of Cumberland devotes a less proportion of its area to wheat than any other county in England, and it is a curious fact, and perhaps only a capricious circumstance, that at a time when nearly all the counties are decreasing their wheat areas, this high-lying north-western county should register an increase. The farmers of Kent increased their wheat area by 677 acres, but both Westmoreland and Kent pale beside the large increases of 6,973 acres in Norfolk and 4,193 acres in Suffolk. It is highly significant that, in a year when the counties of England diminished their aggregate wheat

TABLE V.—*Acreage of Wheat in each County of England.*

County	Total area	Acres of wheat, 1892	Acres of wheat, 1891	Increase (+) or decrease (−) in 1892 compared with 1891	*Decrease* in 1892 compared with 1882
	acres			acres	acres
Bedford . .	298,494	41,485	44,724	−3,239	8,627
Berks . . .	462,503	44,517	44,752	− 235	13,415
Buckingham . .	475,694	39,703	43,042	−3,339	12,256
Cambridge . .	549,749	109,639	110,191	− 552	8,351
Chester . .	657,122	13,660	15,376	−1,716	13,790
Cornwall . .	868,208	29,363	29,767	− 404	12,879
Cumberland .	970,161	5,305	5,028	+ 277	10,208
Derby . . .	658,874	14,380	17,327	−2,947	10,226
Devon . . .	1,667,097	70,717	74,888	−4,171	41,236
Dorset . . .	632,272	27,662	28,162	− 500	11,471
Durham . .	647,486	18,844	20,510	−1,666	12,502
Essex . . .	987,031	141,288	144,664	−3,376	24,233
Gloucester . .	796,731	57,266	60,899	−3,633	24,75
Hants . . .	1,037,765	76,257	77,236	− 979	20.969
Hereford . .	537,363	30,854	34,606	−3,752	20,028
Hertford . .	406,160	56,904	56,968	− 64	5,565
Huntingdon . .	234,218	35,806	37,344	−1,538	7,009
Kent . . .	995,390	67,885	67,208	+ 677	20,099
Lancaster . .	1,187,404	17,096	20,250	−3,154	12,431
Leicester . .	527,119	24,220	27,804	−3,584	12,458
Lincoln . .	1,693,547	210,227	226,060	−5,833	63,999
Middlesex . .	181,301	4,802	4,892	− 90	1,608
Monmouth . .	341,687	7,799	9,307	−1,508	8,352
Norfolk . .	1,312,954	166,425	159,452	+6,973	22,827
Northampton .	641,991	51,988	54,300	−2,312	18,459
Northumberland .	1,283,264	12,103	13.303	−1,200	15,468
Notts . . .	539,754	45,023	48,905	−3,882	20,942
Oxford . . .	483,617	42,880	44,732	−1,852	16,537
Rutland . .	97,273	5,606	6,151	− 545	3,157
Salop . . .	859,516	42,931	47,227	−4,296	29,167
Somerset . .	1,042,488	40,539	42,813	−2,274	20,958
Stafford . .	749,671	26,460	28,686	−2,226	20,561
Suffolk . .	948,826	129,796	125,603	+4,193	11,112
Surrey . . .	485,128	26,539	27,539	−1,000	10,865
Sussex . . .	933,269	67,462	71,676	−4,214	18,415
Warwick . .	577,466	41,729	44,036	−2,307	20,106
Westmoreland .	500,905	353	390	− 37	614
Wilts . . .	880,249	65,015	67,011	−1,966	18,842
Worcestershire .	480,491	38,279	41,145	−2,866	16,152
York (E. Riding)	749,436	69,999	72,892	−2,893	27,544
York (N. Riding)	1,363,644	31,825	36,913	−5,088	24,569
York (W. Riding)	1,766,001	52,308	58,614	−6,306	33,764

area by 89,424 acres, the two most easterly of our counties should have recorded a collective increase of 11,166 acres. More than this, if the counties of Lincoln, Cambridge, Norfolk, Suffolk, and Essex,—which may fairly claim to constitute the "wheat belt" of England, for they embrace more than one-third of its entire wheat area—be taken together, it appears from Table VI. that, despite decreases in

TABLE VI.—*Wheat Area in Eastern Counties of England.*

County	1892	Compared with 1891	
		Increase	Decrease
	acres	acres	acres
Lincoln . . .	210,227	—	5,833
Cambridge . . .	109,639	—	552
Essex . . .	141,288	—	3,376
Norfolk . . .	166,425	6,973	—
Suffolk . . .	129,796	4,193	—
——	757,375	11,166	9,761

three of these counties, they show in the aggregate a balance of 1,405 acres on the side of increase, this being the amount by which the increased area of 11,166 acres in two of the counties exceeds the diminished area of 9,761 acres in the remaining three.

Although the withdrawal of 5,833 acres from wheat in 1892 in Lincolnshire may look large, it must be noted that no other county in England has so great an area of wheat as this county of fat marsh lands and wolds; as a matter of fact, the shrinkage of its wheat land in 1892 amounted to only $\frac{1}{36}$ of its wheat area in 1891. The counties which specially suffered in 1892 were Derby and Monmouth, which each lost one-sixth of its wheat area; Lancashire and the North Riding, which each lost one-seventh; Leicester, which lost one-eighth; and Hereford and the West Riding, which each lost one-ninth. A glance at the map of England [1] will show that none of these counties touch the "wheat belt" of the East of England. The shrinkage in Shropshire of 4,296 acres may appear large, but it does not represent more than one-eleventh of the wheat area of 1891 in that county.

It is, however, when we proceed to compare the wheat areas of our counties at the present time and ten years ago, that a full idea of the shrinkage is brought home to the mind. The last column of Table V. shows to what extent the wheat acreage of each county in 1892 falls short of the corresponding acreage in 1882. So that, by adding the number in this column to the number for the same county in the column headed 1892, the wheat acreage of that county for 1882 is ascertained. The last column of figures presents not a single exception to the universal law of decrease, which means that there is

[1] A map of England showing the counties will be found on page 364 of this volume of the Journal (Part II.).

not a county in England—not even in the "wheat belt"—that did not devote a less area to wheat in 1892 than in 1882, the aggregate effect being that in 1892 England had only three-fourths as many acres under wheat as in 1882.

It is possible to make a rough classification of the counties based on the extent to which they have respectively abandoned wheat-growing during the last decade.

At the head of the list stand the comparatively unimportant counties of Cumberland and Westmoreland, which have each lost two-thirds of their wheat area.

The counties of Chester, Monmouth, and Northumberland have each lost one-half.

In Derby, Devon, Durham, Hereford, Lancaster, Leicester, Notts, Rutland, Salop, Somerset, Stafford, the North Riding and the West Riding, the diminution amounts to from one-third to one-half of the acreage of 1882.

In Cornwall, Dorset, Gloucester, Kent, Middlesex, Oxford, Surrey, Warwick, Worcester, and the East Riding, the decrease ranges from one-fourth to one-third of the acreage of 1882.

Of the twenty-three English counties mentioned in the two preceding paragraphs, it may be stated in general terms that in 1892 they have lost from one-half to one-fourth of their wheat acreages of 1882. It deserves to be noted that these counties occupy a well-defined zone extending from the southern borders of Northumberland and Westmoreland to the southern shores of Dorset, Devon, and Cornwall, and spreading out in the Midlands, especially on their western side. Enumerated in geographical order, the counties in which the wheat acreage has thus shrunk between 25 and 50 per cent. during the ten years are those of Durham, York, Lancaster, Derby, Notts, Rutland, Leicester, Stafford, Salop, Hereford, Worcester, Warwick, Oxford, Gloucester, Somerset, Dorset, Devon, and Cornwall. To these must be added an outlying group in the south-east, comprising the counties of Middlesex, Surrey, and Kent.

The counties of Berks, Bucks, Hants, Lincoln, Northampton, Sussex, and Wilts have now wheat areas from one-fifth to one-fourth less than the corresponding areas of 1882. These seven counties, taken in the order of Lincoln, Northampton, Bucks, Berks, Wilts, Hants, Sussex, are also seen to occupy a well-defined and continuous geographical area.

Of the seven remaining counties, Beds and Hunts have lost one-sixth of their wheat acreage of 1882; Essex has lost one-seventh; Norfolk one-eighth; Hertford and Suffolk have each lost one-twelfth; whilst Cambridge has suffered a diminution on the decade of only one-fourteenth of its wheat acreage.

Though Lincoln, the largest county in England except Yorkshire, has the greatest absolute acreage of wheat, yet Cambridge is the premier county as regards relative extent of the wheat area. Of the 40 or 42 English counties Cambridge only comes twenty-fifth as regards size, but rises to the fifth or sixth position when the absolute acreage of wheat is considered. Out of every 1,000 acres of

cultivated land in Cambridge in 1892, there were 224 under wheat. In Lincoln the proportion was only 138 per 1,000. Hence, making allowance for the difference in size of the two counties, wheat-growing is practised more than half as largely again in Cambridge as in Lincoln. It is apparent that the farmers of Cambridgeshire have clung to the wheat crop with greater fidelity than those of any other county.

The general outcome of this inquiry is to demonstrate that during the last decade the wheat area has undergone shrinkage in every county of England, also that the relative decrease has been greatest in the outlying counties of the North and West, and least in the compact group of Eastern counties—Cambridge, Huntingdon, Bedford, Hertford, Essex, Suffolk, and Norfolk—lying between the Wash and the Nore.

During the recent autumn much currency has been given to the phrase "the abandonment of wheat-growing in England." Whilst an inquiry like the present serves to define and localise the progress of such abandonment, it is silent upon a question of the highest interest and importance. That the wheat area in England is undergoing a steady decline is abundantly proved by the stern facts set forth in the accompanying Tables. But whether this decline is due to the absolute abandonment of wheat cultivation upon certain farms where formerly it was practised, or whether it merely arises from a restriction—falling short of extinction—of the wheat acreage upon wheat-growing farms, is a question for the answer of which no available data exist. There is no essential relation between the number of acres of wheat and the number of farmers who grow wheat. Supposing the lessened area to have been brought about mainly by a diminution of the wheat acreage on the part of each wheat-grower, there might be little or no decrease in the number of farmers who seed a portion of their land to wheat. In this case the interest in the wheat crop, as one of the crops of the farm, would continue to be as widespread as ever.

W. FREAM.

THE MANUFACTURE OF IRON IN ITS RELATIONS WITH AGRICULTURE.[1]

THE object of this paper is not to speak of the important service rendered by iron to agriculture, even at the time when our corn was threshed with the flail, and when our land was ploughed by an implement formed chiefly of wood. Neither am I going to claim, from the farmer, an acknowledgment for our having furnished cheap materials, out of which the mechanical engineer has constructed a variety of labour-saving instruments for his use. The

[1] Extracts from an Address delivered before the Iron and Steel Institute, in October, 1892, by Sir Lowthian Bell, Bart., F.R.S. Revised by the Author.

link which connects us with our food-producers belongs to chemical, and only incidentally to mechanical, science.

As is well understood, failure would attend any attempt to produce a crop from the moistened mineral matter which enters into the composition of the soil. For the purposes of fertility the presence of organic matter is necessary, the main object of which is to assist in the assimilation of the earthy substances which enter into the composition of what are known as the ashes of the plant. These are small in quantity, but are indispensable for the existence of vegetable life.

Not the least remarkable phenomenon in connection with the production of what may be regarded as the origin of all food is the enormous area from which plants have to gather their nutrition and, therefore, their substance. Towards this the soil contributes little or nothing, and it is from our vast atmosphere itself that all the carbon which enters, to the extent of 35 to 50 per cent., into most vegetable matter is derived. This element, in the form of carbonic acid gas, is found in the air we breathe to the extent of only 4 volumes in 10,000. Notwithstanding this mere trace, it has been estimated that in our atmosphere there is stored up more carbon than is contained collectively in the earth's surface in the solid form, in the bodies of plants and animals, and under the earth's solid crust in the coal formation.

Before I proceed to the more immediate objects of this paper, I will say a word or two on another constituent of vegetable life, which indeed may perhaps be regarded as covered by the title. I refer to the metal iron. Usually, the ash of plants does not exceed $2\frac{1}{2}$ per cent. of their weight, that of wheat, according to Boussingault, ranging from 2·34 to 2·43 per cent. Of this, possibly $2\frac{1}{2}$ per cent. only is oxide of iron. Out of this small beginning, I remember Hope, of the Edinburgh University, or Thénard, of the Sorbonne, telling us nearly sixty years ago that an adult human body extracts from the food only as much iron as would make a wedding ring. In McKendrick's *Physiology* the actual quantity is stated to be 3 grammes, or say $46\frac{1}{4}$ grains. The metal in question is chiefly to be found in the blood, and upon the proper changes in point of oxidation of this minute quantity is animal life entirely dependent. Introduce a substance sufficient in quantity to interfere with this series of alternations, and death may be almost instantaneous. As an example, a very small volume of sulphuretted hydrogen—probably one in 300 or 400 of air—would vitiate all the blood in a human being in the space of 25 seconds.

The two ingredients which enter into the composition of all animals, and therefore into that of the vegetables upon which animals feed, and which concern us at present, are nitrogen and phosphorus, and it is to these that the remainder of this paper is exclusively directed.

Nitrogen.—Although nitrogen constitutes fully three-fourths of the air we breathe, it was long considered that neither vegetable nor animal was able to assimilate, by direct absorption, any

atmospheric nitrogen. Such at least was the doctrine taught by Liebig, who believed that ammonia or its compounds were the vehicles which conveyed this form of nourishment through the vegetable to the animal world. As in the case of carbon, so with ammonia ; we have also to look to the atmosphere for our original supply of this alkali, in which, however, it exists as a mere trace—one part in one million of air. Liebig himself estimated that if it were all collected at the sea-level and had a density corresponding to the atmospheric pressure there, it would form a stratum less than a quarter of an inch in depth. This ammoniacal nitrogen, partly in the form of nitrite or nitrate or carbonate of ammonium, is brought down by rain and received into the plant through its roots from the soil. This means decomposition of the alkali into nitrogen and hydrogen ; and although fresh ammonia is generated by vegetables and animals during their decay, yet, in a densely populated country like ours, and with our sanitary arrangements upon their present footing, the waste of assimilable nitrogen is enormous, and appears to require being compensated for from other sources than those which have just been enumerated.

Ammonia and its compounds are put to other purposes than the stimulation of vegetable life, but the ammonia contained in the atmosphere is too diluted to be of any use in the arts. A very small quantity, and very irregular in its occurrence, in the form of sal-ammoniac (or ammonium-chloride), is occasionally met with in volcanic regions. Chaptal, the French chemist, who wrote near the end of the last century, states that all the sal-ammoniac then required in commerce was made in Egypt from the distillation of camels' dung with common salt, the fuel used being also the dung after it had been dried. Animal matters with salt were also exposed at a subsequent date to a high temperature in this country, and the resulting ammoniacal salt was collected and supplied, of course, at very high price. So late as a quarter of a century ago it was sold at 40*l.* or 50*l.* per ton, the value now being about 35*l.* It is clear that all these processes must have been attended with considerable expense, quite incompatible with the use of ammonia as a medium for enriching the soil.

If we descend through the crust of the earth until we reach those subterranean forests which now form our coal, and if we examine their composition, we find that countless ages ago nitrogen was assimilated by vegetation as it is at the present day, and is to be found in pretty much the same quantity as exists in the plants growing in our own time. When coal is burnt in an open fire, all the hydrogen it contains, including that in the ammonia, is converted into water, leaving the nitrogen to escape as such, with the formation of little or no ammonia. If, however, the coal is heated in a closed vessel with salt, air being excluded, the volatile carbon and its associated hydrogen pass off as tarry matter, and the nitrogen, taking up hydrogen, is carried over in the form of the precious ammoniacal alkali so much wanted.

Coal, up to the earlier part of the present century, was

rarely submitted to the distillatory process just referred to. It occurred, however, to Mr. Murdoch, exactly a hundred years ago, to light his house by gas so obtained. Yet the discovery made such slow progress that when I went to Paris thirty-five years after Murdoch's application of coal-gas for illuminating purposes, the Rue de Rivoli was, I believe, the only street lighted by its means. At the present time not less than seven millions of tons of coal are annually used in the public gas-works of the United Kingdom alone. During the process of distilling gas a considerable quantity of tarry substance comes over, and along with it a certain amount of watery matter. The former, known as coal-tar, for many years in my life was burnt or run away, and all the watery portion, containing the nitrogen in the form of ammonia, found its way also into the drains which led to the rivers. Chemistry afterwards opened out extensive fields for the utilisation of this liquid tarry hydrocarbon, and the ammonia for some years past has been converted into sulphate, and handed over to the husbandman as a source of nitrogen for his growing crops. If all the coal treated in our gasworks were made to yield its ammonia, more than 60,000 tons of the sulphate would be produced, worth, at less than half its former price, about 600,000*l.* a year. To this sum has to be added the value of the tar.

We are probably within the mark in saying that more than fifteen million tons of coal are annually coked for the use of our ironworks. The whole of this is effected in ovens where the gas is burnt under conditions which preclude the possibility of any tar or ammonia being rendered available. My firm were early adventurers in the field for avoiding this terrible waste in this country. The coal was placed in ovens, which were virtually retorts; the gas evolved during the process was passed through a series of condensers, which intercepted the tar and the ammoniacal solution, and the gaseous hydrocarbons, thus purified, were used for heating the oven. Coke so made, however, was found less suitable for blast-furnace work than that obtained by direct application of heat to the surface of the coal, and the plan, to our disappointment and regret, was abandoned. Thus is incurred an annual loss of sulphate of ammonia worth considerably above a million sterling. From both these sources of ammonia—gasworks and occasionally coke ovens—9,000 to 10,000 cubic feet of gas per ton of coal is obtained, and a quantity of sulphate represented by something under 5 lb. of ammoniacal gas.

Of the pig-iron produced in Great Britain about one million tons are obtained by the use of raw coal, of which about two tons are required per ton of metal, capable of furnishing about 17,000 tons annually of sulphate of ammonia. The success which had attended the extraction of ammonia from the gas made for illuminating purposes led the Scotch ironmasters to consider the feasibility of applying condensers to the gases as they leave their blast-furnaces. In the blast-furnace, however, not only are the 10,000 cubic feet of hydrocarbons to be gasified, but all the fixed carbon,

save the small quantity which enters into combination with the iron, escapes as carbonic oxide or carbonic acid. In addition to this we have the carbonic acid of the flux and the nitrogen of the blast, which more than double the volume of the gases, so that the ammoniacal gas rarely exceeds $\frac{1}{800}$ of the total, and is generally considerably less even than this. The lowest consumption of raw bituminous coal, per ton of iron made, I have ever heard of is a trifle above 31 cwt., but it often exceeds the 40 cwt. named. According to analysis, the blast-furnace gases using the lesser weight of fuel had the following composition :—

—	By volume	By weight
Carbonic acid	8·61	13·08 = 3·56 carbon
Carbonic oxide	28·06	27·12 = 11·62 ,,
Marsh-gas	4·37	2·41 = 0·96 ,,
Hydrogen	5·45	0·38 ——
Ammonia	0·13	0·08 16·14 ,,
Nitrogen	53·38	51·59
Water	—	5·34
Total	100·00	100·00

Thus one volume of ammonia was accompanied by 769 volumes, or 1,250 parts by weight, of other gases. It is estimated that each ton of coal burnt in the furnace is associated with the generation, of about 90,000 cubic feet of gas, and that it yields 4·38 lb. of ammoniacal gas. In such circumstances, it is quite obvious that the condensation of so small a quantity of this gaseous alkali becomes a very difficult problem as compared with operations where the same quantity has to be extracted from something like one-tenth of this enormous volume of gas.

Nevertheless, at the present time, almost every furnace in Scotland now in work is provided with the essential appliances for the recovery of ammonia, and for its conversion into sulphate.

It is not necessary, however, to trouble agricultural readers with a technical description of the somewhat complicated plant by means of which this remarkable result is obtained.

Suffice it to say that the ammonia gas is dissolved in water and the yield of raw products has averaged 120 gallons of ammoniacal liquor (of two degrees of Twaddell's hydrometer), and 25 gallons of tar, per ton of coal used in the furnaces.

The ammoniacal gas is driven off from the liquor by means of steam in continuous ammonia-stills, lime being introduced into the bottom compartment of the stills to remove any fixed ammonia, should this be present in sufficient quantity to pay for recovery. The steam is obtained by means of blast-furnace gas which has passed through the condensing apparatus. The ammoniacal gas from the stills is passed into saturators containing sulphuric acid, where the sulphate of ammonia is deposited, and is then

placed on draining tables, being afterwards transferred to the sulphate store-house.

By the courtesy of the Carnbroe Chemical Company I am enabled to quote the results obtained at Messrs. Merry and Cuninghame's ironworks over a period of three weeks. During this time three of their furnaces were being blown for a fortnight, and four for the third week, equal therefore to three and one-third furnaces for the whole time. The weight of coal consumed was 5,841 tons, which gave the following quantities of the three products named :—

	Tons	Cwt.		£	s.	d.		£	s.	d.
Sulphate of ammonia	48	8	sold at	10	10	0	=	508	4	0
Pitch . . .	361	0	,,	1	1	0	=	379	1	0
Oil . . .	33,750 gallons		,,	0	0	$1\frac{1}{2}$	=	210	18	9
								1,098	3	9
Paid:—For wages, sulphuric acid, management, railway dues, and allowance for depreciation of plant								379	12	3
Balance, being profit, and interest on plant = 2*s.* $5\frac{1}{2}$*d.* per ton of coal.								718	11	6

If, as is proper, we regard the addition of sulphate of ammonia, hitherto wasted, from a national point of view, we are entitled to credit the processes by which this is achieved with the difference between its present and former price. This, upon the quantity dealt with in the statement of account just rendered, means a gain of about 250*l*.

Phosphorus.—Two hundred and twenty-three years ago Brandt, a Hamburg alchemist, while engaged in searching for a body capable of converting silver into gold, discovered phosphorus. After the lapse of two hundred years this element has acquired an indifferent reputation among iron-makers, owing to its tendency, in their experience, to reverse the order of the transmutation in the two metals to which Brandt hoped to apply it. Low as phosphorus stands, however, in the estimation of the ironmaster, something like 3 to 4 lb. are indispensable for building up and maintaining the life of every full-grown human being. Although of very frequent, we may say of universal, occurrence in the crust of the earth, yet, when compared with the enormous masses of silicious, aluminous, and calcic minerals, which abound everywhere, phosphorus cannot be otherwise regarded than as an extremely rare substance. It is, moreover, held firmly united as phosphoric acid with certain earths, of which lime is probably the chief. From the minerals which contain phosphorus it is transferred by the disintegration of its matrix to the alluvial deposits in which, however, as soil it exists in very minute quantities.

It appears to be a well-established fact that the ores of iron found so abundantly in the older rocks are, compared with those of more

recent origin, singularly deficient in phosphoric compounds. The Labour Commissioner of the United States gives certain particulars respecting some 100 specimens of ore. Of these thirty-five average 65·43 per cent. of metallic iron, which, if all were per-oxidised, leaves only 6·53 per cent. of foreign matter. If all these were the produce of the Lake Superior mines—and most of them doubtless are so—we may, from the hardness of the older rocks in which they occur, expect only a small admixture of earthy contamination. These ores, therefore, belong to strata of the Silurian age, a period when phosphoric acid had not become concentrated to the extent in which it is found in more recent geological horizons. Accordingly, we only have 0·061 per cent. of phosphorus in these thirty-five cases. The next group of ten varieties of ore gives an average of 57·8 per cent. of iron, and therefore 17·43 per cent. of earths, and 0·222 of phosphorus. We then come to twenty-six specimens of much more recent origin, and containing only 45·61 per cent. of iron, 34·15 of earths, and 0·339 per cent. of phosphoric acid. Lastly, seven examples, chiefly of the coal formation, with 35·46 per cent. of iron, 35·46 of earths (49·37 inclusive of carbonic acid), and 0·474 per cent. of phosphoric acid.

In order to extend the field of observation I have taken out of a list of analyses in Percy's work on "Iron and Steel" the following English examples, which I have placed according to their geological sequence, beginning with the oldest :—

Description of the Ore	Geological Position	Number of Examples	Average of Phosphoric Acid	Average of Iron
			per cent.	per cent.
Red hematite . .	Probably Carboniferous Limestone	6	Trace	64·89
South Wales . .	Coal formation	10	0·151	28·42
West Yorkshire .	Coal formation	6	0·189	32·08
South Staffordshire	Coal formation ordinary run	10	0·201	37·82
Derbyshire . .	Coal formation	9	0·204	29·15
Most likely North Yorkshire . .	Lias	3	0·542	38·95

In thus tabulating the ores of iron to show a possibility of their content of phosphorus having increased as the concentration of this element by vegetation progressed, I would not be understood as maintaining that there are not exceptions to such a supposed law. On the contrary, I am fully aware that exceptions are to be found to its operations, one indeed appearing in the table of examples just quoted. In it, among British ores at the head of the list, comparatively free from phosphorus, stands red hematite, found so abundantly in a formation so recent as the Carboniferous Limestone, and in the adjoining rocks.

From whatever cause, it is quite certain, however, that the clay ironstones of the Carboniferous strata are so charged with phosphoric

acid that the pig-iron they produce is entirely unfitted for the ordinary Bessemer process. But, it is when we are dealing with iron-ore in the still more recently deposited rocks of the Lias formation, that we meet with the full measure of inconvenience caused by the presence of phosphorus. The iron-mud and earthy mud, the result of the disintegration of the shales of the period, would be carried down into the seas of that time. There, the accumulated remains of organised beings of marine origin, which had derived some phosphorus from the sea they inhabited, were buried in the mud containing carbonate of iron, and so became part and parcel of the ironstone now so extensively worked in the Cleveland Hills. Among the animals so entombed some were of considerable dimensions.

In order to convey an idea of the volumetric extent to which the non-metals enter into Cleveland pig-iron, I constructed a diagram showing the relations they bear to the metal itself. In it the pure metal iron is represented by an equal-sided rectangular figure containing 400 square inches, being thus a square of 20 inches to the side. With this as a standard of comparison, carbon is represented by a square containing 49.81 square inches; phosphorus, 22·09; silicon, 21·90; and sulphur, one containing 2·37 square inches. Rich, comparatively speaking, as Cleveland ironstone is in phosphoric acid, it is obvious that, although a low-priced mineral, it would be impracticable to use it as a fertiliser on our land. When, however, we submit it to the action of the blast-furnace, the phosphorus contained in $3\frac{1}{4}$ tons of ore passes into 20 cwt. of pig-iron. A good deal more than twenty years ago I pointed out the loss our country was incurring by allowing the phosphorus of 20,000 tons of phosphoric acid to poison 2,000,000 tons of pig-iron annually, at the same time that our ships were scouring the seas in search of the identical substance from the remotest parts of the earth.

We are, I am glad to say, on the way of eventually removing this scandal from the manufacturing escutcheon of the nation, by the introduction of the basic process. Attempts, soon after its discovery, were made in Germany to free the slag—into which the phosphorus as phosphoric acid passes—from what was useless as a manure, but which slag contains ten times as much phosphoric acid as did the parent ironstone. It was, however, speedily discovered that in the laboratory of Nature this operation was performed by the plants requiring phosphoric acid,—not with the same speed as, but much more cheaply than, it could be done in the workshops of the chemist.

LOWTHIAN BELL.

RECENT AGRICULTURAL PUBLICATIONS.

Of the four works which form the subject of this notice, one is French, one is German, and the remaining two are English. They are reviewed in the following order :—

1. Butter analysis.	3. Cattle breeding.
2. Seeds and seedlings.	4. Agricultural entomology.

BUTTER ANALYSIS.[1]

This work is a most complete record of investigations, carried out during recent years by the leading English, Continental, and American chemists, on the composition and properties of butter and its adulterants. As a compilation the work is a valuable one for reference, all recognised processes—both chemical and physical—used in the analysis of butter and for the detection of adulteration being elaborately and carefully described and criticised. A vast amount of labour must have been expended in the collection of the information here presented. It is, however, unfortunately overburdened with a multiplicity of insignificant details—page after page being devoted to the description of trifling modifications of processes suggested by various experimenters—which have really no scientific or practical importance.

The author in the opening chapters touches generally on the preparation of natural butter and of the various animal and vegetable fats used for its sophistication. The physical properties and the chemical analysis of the fats are next dealt with, and tables of analyses of natural and artificial butters are given. The optical and microscopical examination of butter and other fats is very copiously gone into, and a large number of tables and plates are appended. The microscopical investigations are, however, more interesting than practically valuable. The composition and characters of the various fats and of their products of decomposition are fully dealt with, and then the author proceeds to the question of the adulteration of butter. He considers that a butter should be taken as adulterated when it contains (1) matters foreign to its normal composition (colouring matters, antiseptics, &c.); (2) an unusual quantity of substances normal to butter (water, casein, salt, &c.); (3) foreign fats —natural or manufactured,—animal or vegetable oils, margarine.

After alluding to the increase in the adulteration of butter and to the difficulty of its detection, owing to the state of perfection to which the manufacture of margarine has been brought, the author proceeds to the discussion of the various analytical processes adopted for the investigation of the purity of butter. Over seventy methods (with their modifications) of analysis are described, and the results

[1] *Traité Général d'Analyse des Beurres.* Par A. J. Zune. Two vols. Pages xii + 490 + 340, with 353 illustrations and 14 plates. Paper covers. Paris. 1892.

of the analysis of more than 1,000 butters from different parts of the world, and, in addition, those of a large number of animal and vegetable fats, are given in tables. In dealing with the variations in composition which are found in natural butters, the author quotes the observations of various investigators on the effect produced on the composition of butter by the method of feeding cows, whether on pasture or in stall, the nature of the food, the breed and age of the cow, and the length of time that has elapsed since parturition; also season, locality, and the mode of churning and packing the butter.

The author criticises in detail the analytical values of the various processes, and of the interpretations placed on the results obtained by them, and he gives his opinion that no chemist or body of chemists is authorised in adopting, as a base for calculations, fixed limits for the amounts of insoluble fatty acids, volatile acids, &c., which shall be present in natural butter. In Volume II., the author describes his own researches and gives a new general method of his own devising for the analysis of butter and other fats. It would be impossible, without entering into technical details, to discuss this new method of analysis; but it may merely be pointed out that the process has for its object the separation and estimation of the several groups of acids of butter-fat, as determined by the solubility, in different reagents, of the baryta salts of these acids. Inasmuch as only half a gramme of butter-fat is taken for this complex series of separations, the experimental error is likely to be sufficiently great to seriously interfere with the accuracy of the process. In chapter v. of this volume, M. Zune discusses the question of the "limits" within which it is possible to detect the admixture of margarine with pure butter. He concludes that in spite of all determinations—physical and chemical—the interpretation of the results will often present serious difficulties on account of the great variability in the composition of natural butter, and he declares, with strong emphasis, that it is impossible to detect with certainty the admixture of 10 per cent. of pure margarine with natural butter. Indeed, by careful selection it would be possible to mix a much larger proportion of margarine with butter without any certainty of detection.

After giving a long list of chemical and physical determinations, which he considers as essential in the ascertainment of the purity of a butter, M. Zune suggests, as a check upon adulteration, that the butter derived from different countries should have definite numerical values fixed, according to each month of the year, for the various constituents. The fixing of "standards," however, appears to be very undesirable. The result would be to perpetuate wholesale and systematic fraud, and to play into the hands of those who have made the sophistication of butter a scientific study.

Upon the important question of the detection of the admixture of margarine with butter, M. Zune has given an able and, on the whole, a fair criticism of the merits of the various methods of analysis adopted for this end. The great difficulty undoubtedly lies

in the fact that butter, the genuineness of which can be proved, does, in exceptional instances, give on analysis results which may differ materially from the average results. As M. Zune remarks, it is better to let a hundred guilty escape punishment than to punish one innocent. Still, too much stress must not be put on the fact that, occasionally, pure butters give abnormal results. It is the knowledge of this fact that enables the adulteration of butter to be proceeded with on the wholesale scale at present practised. A very large proportion of the butter imported into this country from abroad is scientifically and systematically "let down," as it is termed, by admixture of margarine in small quantities. The introduction of even 5 to 10 per cent. of margarine makes a great difference in the profits, and enables the manufacturers to undersell those who honestly produce pure butter.

The difficulty of the public analyst is that, although he may rightly suspect the admixture of margarine in small quantities, yet his report is liable to be upset on the ground that the butter in question might be abnormal. One important point must not be lost sight of. Butter as produced on a large scale in factories is not the produce of a single exceptional animal, nor even of a single herd of cows, but is a product from many different farms and small factories. Any occasional abnormality of composition will accordingly be lost in the overwhelming proportion of butter of normal composition.

EDWARD WILLIAM VOELCKER.

SEEDS AND SEEDLINGS.[1]

"No one who has ever looked at seedlings can fail to have been struck by the contrasts which the cotyledons afford, not only to the final leaves, but even to those by which they are immediately followed.

"Let us then take certain plants (especially, as far as possible, the most familiar), and see what light can be thrown on the varied forms which their seedlings present. Look, for instance, at the familiar Mustard and Cress; the first (fig. 1) has kidney-shaped cotyledons, one of them rather larger than the other; while the Cress, on the other hand, has the cotyledons (fig. 2) divided into three lobes. The Pink has broad cotyledons, the Chickweed narrow ones; those of the Beech are (fig. 3) fan-shaped in outline; those of the Sycamore shaped almost like a knife-blade; those of Eschscholtzia divided like a hayfork; those of the Bean or Acorn thick and fleshy.

"Mustard and Cress were the delight and wonder of our childhood; but at that time it never occurred, to me at least, to ask why they were formed as they are, and why they differed so much. So

[1] *A Contribution to our Knowledge of Seedlings.* By the Right Hon. Sir JOHN LUBBOCK, Bart., M.P., F.R.S., D.C.L., LL.D. In two volumes. Pages viii. + 608 + 646. With 684 figures in text. London: Kegan Paul, Trench, Trübner, & Co., Ltd. 1892.

they grew, and beyond that it did not occur to me, nor I think to most, that it was possible to inquire."

If, at the time to which he refers, it never occurred to Sir John

Fig. 1.—Seedling of Mustard, *Brassica nigra*, × 3.

Fig. 2.—Seedling of Cress, *Lepidium sativum*, × 3.

Lubbock, as he tells us in the above words (vol. i., page 3), to inquire into these matters, much less was it likely to occur to those who are endowed with only the ordinary powers of observation. As the skilled investigator hints, even the possibility of such an inquiry appeared to be remote. Not only, however, has it been accomplished, and by Sir John Lubbock himself, but the result is embodied in the two volumes before us. How many years of unwearying labour the task has involved is best known to him who has effected it, but it is safe to say that there is scarcely a page in the entire work which does not record some new observation or discovery.

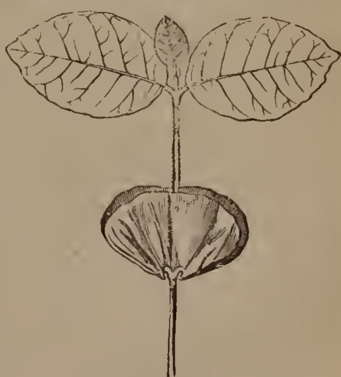

Fig. 3.—Seedling of Beech, *Fagus sylvatica* half natural size.

There can be but few cultivators who have not experienced a thrill of satisfaction on seeing the tender braird of a newly sown crop gradually cover, as with

a green mantle, the recently tilled land. It is, as it were, the first earnest of the coming reward for all the toil that has been expended. Excepting the cases of grasses and cereals, the seeds of most of the plants cultivated on the farm contain two seed-leaves—or cotyledons, as the botanist terms them. As a rule these cotyledons, in the course of germination, free themselves from the seed-coat and appear above ground as the first green leaves of the young plant or seedling. No one is more familiar with cotyledons than the turnip-grower, for he is aware that it is just at the critical stage when the seed-leaves have appeared above ground, and before the subsequent leaves have begun to expand, that the plant falls a victim to the ravages of the turnip "fly." If by any means the plant is hurried from the "smooth-leaf" into the rough-leaf stage it usually escapes, for the dainty palate of the "fly" disdains the rough leaf. The smooth leaves, in fact, are the cotyledons, and it is precisely when the turnip crop is in this mustard-and-cress salad stage that the "fly" pounces upon it.

No terms, perhaps, are better known to farmers who grow turnips and swedes and rape than "smooth leaf" and "rough leaf," and the fact that these terms are applied to the leaves of one and the same plant at once suggests that the plant produces leaves which are not all alike. Sir John Lubbock asks the questions, why are not the leaves of a plant all alike, and why should they differ? "The germination of plants," it is remarked in the preface, "is certainly not the least interesting part of their life history, but it has not as yet attracted the attention it deserves. The forms of cotyledons, and the fact that they differ so much from the subsequent leaves, had of course been attended to more or less fully in botanical works, but no explanation had been offered, and Klebs in a recent memoir expressly states that the problem is still an enigma"

It is quite possible that people who have never taken the trouble to examine a seedling plant may entertain the idea that all cotyledons, or seed-leaves, to whatever plant they may belong, are pretty much alike. This, however, is far from being the case. Some cotyledons are narrow, as in the Fennel and Sycamore; some are broad, as in the Beech, Acorn, Bean, Cabbage, and Pink. How many people have noticed that in the Mustard, eaten as a salad, the two cotyledons (fig. 1) are unequal? The same is the case in the Cabbage and Radish. In other species there is inequality, not between the two cotyledons, but between the two sides of the same cotyledon, as in the Laburnum and the Lupin. Though most cotyledons are entire, in some cases they are more or less lobed,—slightly lobed, perhaps, as in Mustard; markedly three-lobed, as in Cress; five-lobed, as in the Lime-tree.

The following remarks on seeds occur on page 56 of vol. i. :—

"As regards the size of seeds, if we could imagine a state of things in which every seed grew and attained maturity, then to keep up the number of any given species existing at the time, it would be sufficient if each plant produced but one or two seeds during its whole life. There is, however, an

enormous destruction of seeds. The great majority are eaten by animals, or fail to secure a suitable site for germination; of those which do germinate, again, many are crowded out by their fellows. Darwin observed that, out of 357 seedlings which came up in a space of three feet by two, no less than 295 were destroyed by slugs and insects. Now the greater the chance against any given seed reaching any suitable locality and attaining maturity, the larger number of seeds must the plant produce in order to maintain its numbers, and, as a general rule, the smaller will the individual seeds be. On the contrary, the greater the chance that each seed enjoys of arriving at maturity, the smaller the number of seeds that is necessary, and in such cases it is an advantage that the seeds should be large.

"Hence parasitic plants generally produce a large number of very small seeds, though there are exceptions due to other considerations, as, for instance, in the Mistletoe (I believe, indeed, in all the Loranthaceæ), where the seeds are carried by birds."

Every ripe seed contains an embryo which, under suitable conditions, is capable of growing into a plant like the parent plant. In some seeds, called *exalbuminous* seeds, such as Bean, Pea, Clover, Turnip, Cabbage, the embryo occupies the whole of the inside of the seed. In others, such as Parsnip, Mangel, Wheat, the embryo does not occupy all the inside of the seed, the space being filled up with nutritive material called endosperm; such seeds are described as *albuminous* or endospermic. In seeds of the latter type the arrangement of the embryo within the seed presents no special difficulties, as the endosperm simply fills up all vacant spaces. In the exalbuminous seeds, on the other hand, "Nature has to exercise much ingenuity, and adopts various devices to fill up the whole space." One plan is to arrange the cotyledons face to face, and then roll them up into a ball; on this principle the long strap-shaped cotyledons of the Sycamore are explained. Another method is again to arrange the cotyledons face to face, but then to simply double them up, as in the Cabbage, Mustard, and Radish.

Some seeds, it is well known, never push their cotyledons above ground. The explanation is thus given (vol. i., page 58):—

"In such cases as the Lupin (fig. 4) the cotyledons become so fleshy and thickened that they almost lose the appearance of leaves; in this instance they are set free by the splitting of the testa. When, however, the testa (or seed-coat) does not readily split, and where in large seeds there is no endosperm, the difficulty of unfolding the cotyledons and extricating them from the seed becomes greater, and we arrive at cases where Nature seems to have abandoned the attempt, and, as in the Oak and Horse Chestnut, the cotyledons never quit the seed. Thus, among the Juglandeæ, Pterocarya has leaf-like cotyledons, while those of the Walnut never quit the shell. Everyone, however, must have observed the elaborate folds into which the two cotyledons are thrown, folds which seem to have no significance or importance now, and which carry us back to a time when the Walnut, like the Pterocarya, had foliaceous cotyledons."

Growers are aware from experience that some kinds of seeds "come up" sooner than other kinds. Here, the size of the embryo exercises an influence. It is obvious that, supposing different

kinds of seeds of equal sizes, the exalbuminous seeds will have the largest embryos, as the latter occupy in such cases the whole cavity of the seed. These, therefore, should be seeds quick to germinate, for the embryo plant has already attained a fair size whilst still in the seed. Examples are afforded by leguminous seeds, such as Peas and Clover, and by cruciferous seeds, such as Cabbage and Turnip, which germinate more quickly than the albuminous seeds (containing small embryos) of, for instance, umbelliferous plants, such as Carrot and Parsnip and Celery.

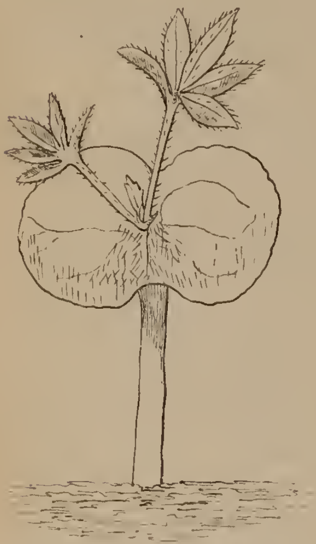

FIG. 4.—Lupin, *Lupinus sulphureus*, natural size.

The conditions under which seedlings are grown have an effect upon the form of the leaves. In the yellow Mimulus, which grows on the banks of streams, it has been noticed that if the seedlings have sufficient room the first leaves possess short stalks and are almost triangular; but, when crowded, the leaf-stalks are longer and the leaves oval. It has been seen that usually the cotyledons of Cress are (fig. 2) three-lobed, yet out of 135 seedlings of this plant, no fewer than 25, or $18\frac{1}{2}$ per cent., differed from the type, and had this character more or less imperfectly developed.

In most plants it seems to be the rule that the transition from the comparatively simple cotyledon-leaves to the normal leaves of the plant, whatever form may be characteristic of these, is not abrupt but somewhat gradual. The first leaves to appear after the cotyledons are generally simple, or at any rate simpler than those which follow. In the Clovers (Trifolium), for example, despite their characteristic leaf of three separate pieces or leaflets (trifoliate), the first leaf to succeed the cotyledons is usually quite simple.

After about eighty introductory pages, in which are discussed points such as are referred to above, upwards of 1,100 pages are devoted to a detailed description of the seedlings which Sir John Lubbock has examined. A botanical arrangement is followed, seeds and seedlings illustrative of about 150 natural orders being described *seriatim*. How many seeds were germinated in the course of this patient and protracted investigation it is impossible to say, but something like 600 seedlings of different species are illustrated by drawings. By the courtesy of the publishers we are able to reproduce some of the illustrations.

Of the seedlings here shown, figs. 1, 2, and 5 are those of cruciferous plants, Shepherd's Purse (fig. 5) being one of the commonest

Fig. 5.—Shepherd's Purse, *Capsella Bursa-pastoris*, natural size.

Fig. 6.—Furze, Gorse, or Whin, *Ulex europæus*, natural size.

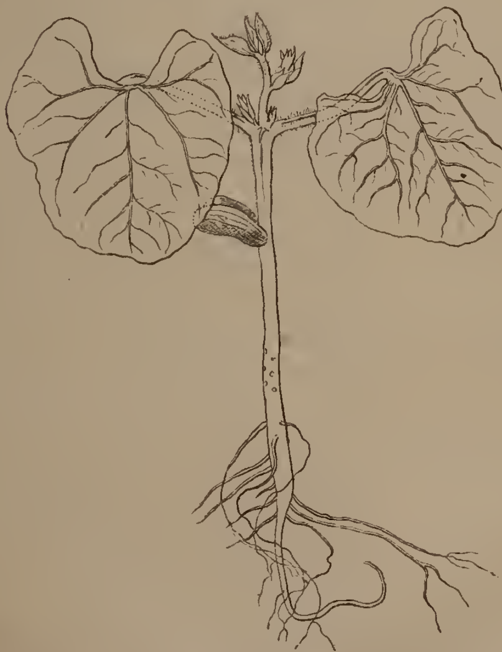

Fig. 7.—French Bean, *Phaseolus vulgaris*, var., half natural size.

of weeds, and remarkable for the varied shapes of its leaves. Figs. 4, 6, 7 are seedlings of leguminous plants. The large fleshy cotyle-

FIG. 8.—Silverweed or Goosetongue, *Potentilla anserina*, half natural size. The numbers indicate the order of development of the leaves.

FIG. 9.—Daisy, *Bellis perennis*, natural size.

FIG. 10. -Yew, *Taxus baccata*, natural size.

dons of the Lupin (fig. 4) are united along their bases, and a marked difference is observable between the cotyledons and the leaves which immediately succeed them. Seedlings of the Furze (fig. 6) may be found in quantities on poor heaths in early summer, especially where furze has been burnt in the previous autumn. In Silverweed (fig. 8), an abundant yellow-flowered wayside weed belonging to the Rose family, there is a wide difference between the cotyledons and the ordinary foliage leaves. In Daisy (fig. 9), on the other hand, the difference is much less marked. Seedlings of Beech (fig. 3) spring up in numbers in beech plantations and copses. In Yew (fig. 10) there is a close resemblance between the cotyledons and the subsequent leaves.

By the publication of this work Sir John Lubbock has opened up a new field of inquiry, and one which can hardly fail to be profitably pursued by cultivators of plants. Such practical questions as the depth of sowing, the character of the seed bed, the quantity of seed per acre, and the treatment of seedling plants may all be studied in a new light when it is appreciated how very greatly seedlings differ from each other. As, moreover, the study is not

only of practical value, but the means thereto are simple, inexpensive, and easily accessible, it suggests a fresh method whereby children in rural schools may be taught to observe and to compare.

CATTLE BREEDING.[1]

This handsome treatise by Dr. Werner, who is a professor both in the Royal Agricultural College and in the Royal Veterinary College, at Berlin, embodies an attempt, as is stated in the preface, to introduce greater exactness than has hitherto prevailed into the methods of describing cattle. This is effected by resorting to actual measurements, which possess both absolute and relative values—absolute in that they serve to define numerically certain physical features

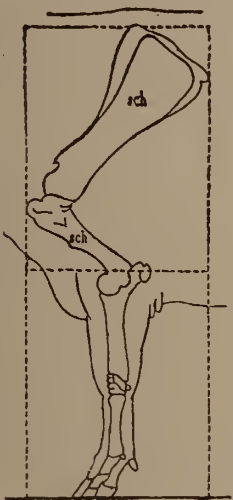

FIG. 1.

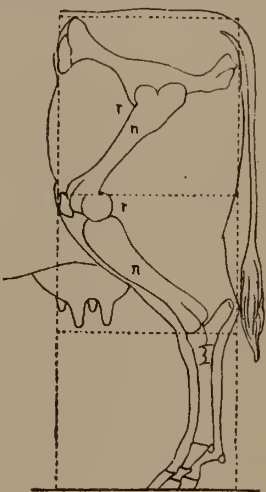

FIG. 2.

characteristic of each breed, and relative in that they permit of a comparison which cannot otherwise be so satisfactorily instituted between one animal and another.

The work is divided into six sections, the first of which is zoological in its bearing, and deals with the buffalo, bison, yak, zebu, and urochs, ending with a history of the domesticated breeds of cattle in Europe.

The second section is concerned with the internal framework and external form (*der Körperbau*) of cattle. In connection with

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[1] *Die Rinderzucht: Körperbau, Schläge, Züchtung, Haltung und Nutzung des Rindes.* Praktisches Handbuch von Dr. H. WERNER, etatsmässiger Professor für Landwirtschaft an der Kgl. Landwirtschaftlichen Hochschule, und Docent für Tierzuchtlehre an der Kgl. Tierärztlichen Hochschule zu Berlin. Pages xii + 645, with 32 illustrations in the text, and 152 plates of cattle. Berlin: Paul Parey, 1892.

the skeleton the position of the limbs is made the subject of a series of diagrams, two of which are here given, fig. 1 illustrating the normal position of the fore-limb, and fig. 2 of the hind-limb. With regard to the fore-limb, it is stated that normally the axis of the shoulder-blade makes an angle of 140° with the spine; the humerus 90°, and frequently 100°, with the shoulder-blade; and similar angular measurements are given throughout. The limbs are defined as being in a normal position when the weight of the body is uniformly distributed on them; and in a "correct" position when the width between the fore-limbs is equal to that between the hind-limbs. In the latter case the limbs should hide each other when regarded either from the front or from the back; in milch cows, however, this is not the case. The "narrow-kneed," "goat-footed," and other abnormal characters of the limbs are described and illustrated.

Next is discussed the influence of climate, food, and exercise upon the development of the body. As regards food, reference is made to Julius Lehmann's account of pigs that had been fed on materials rich in carbohydrates; potatoes, for example. The animals remained lean and progressed but slowly, yet were noteworthy for the size of their heart, lungs, and liver. Similarly, in the case of cattle, Baudement found the breast-measurement larger in early-matured fat oxen, but the weight of the lungs nevertheless smaller than in late-matured beasts. The skin and hair, head, body, and limbs are successively passed under review, reference being made to the circumstance that the skin is thicker on the hind quarters than on the breast. Of the parts of the head the cheeks are usually fuller in the case of younger animals, and are more fleshy in bulls than in cows. Notice is taken of the practice of dishorning cattle in the United States, based on the grounds (1) that the animals can feed together better, and more can be kept in a given space; (2) that railway or steamship transport is cheaper, as well as less dangerous both to the beasts themselves and to the persons who have charge of them. To perform the operation the animal is tied up in the ordinary way, the head is raised by means of a halter, and each horn is sawn off in four or five strokes. The animal paws the ground somewhat, but there is little loss of blood, and the wound gradually heals. In cows the quantity of milk declines at dishorning, but inasmuch as the percentage of fat rises the production of that ingredient cannot be seriously affected.

The third section, occupying 250 pages, is the longest in the book, and treats of the following four main groups of European breeds:—

A. Early or primitive cattle . . .	*Bos taurus primigenius.*
B. Cattle with long foreheads . .	*Bos taurus longifrons.*
C. Cattle with large or broad foreheads .	*Bos taurus frontosus.*
D. Short-headed cattle	*Bos taurus brachycephalus.*

To group A belongs *Bos taurus primigenius germanicus*, var. *anglo-saxonicus*, under which the author includes the Shorthorn and the Red Polled breeds. To the same group are referred the

Caledonian cattle, which are made to embrace the Wild White Cattle of Great Britain, the West Highland breed or Kyloes (earlier known, it is stated, as North Argyleshire cattle), the North Highland breed, the Ayrshire breed, and the Scotch Polled cattle. Under group B positions are assigned to the Jersey and Guernsey breeds. No British breeds are referred to group C. Group D places the Kerry and the Brittany cattle next to each other, and notice is then bestowed upon what the author terms the Polled Irish breed (*der ungehörnte Schlag in Irland*), of which it is stated :[1]—

"The animals of this breed are of light-brown colour, whilst the shape of their heads and the general form of their bodies point to the conclusion that they belong to the Celtic race of cattle, save that they have no horns, and that, in the fertile valley of the Shannon, they attain a weight often approaching that of the Shorthorns. At the Christmas Show of 1871, a stall-fed ox, 4 years 10 months old, weighed 977 kg. (=2,150 lb). The animals of this breed are rapidly dwindling in number in consequence of persistent crossing with Shorthorns."

Welsh cattle follow, and are made to comprise the "South Wales Black-breed, Welsh Black-breed, Pembrokeshire or Castlemartin breed, Welsh Runts," on the one hand, and "North Wales Black-breed" on the other. Then come the Longhorn cattle, *Bos taurus brachycephalus licestriensis.* The British race, *Bos taurus brachycephalus britannicus*, comprises the North Devon breed, "the South Devon breed or Somerset breed" (*sic*), the Sussex breed, and the Herefordshire breed.

The subject of breeding occupies the fourth section, and is replete with information of practical interest. Incidental reference is made to tuberculosis, and it is recommended that calves be fed upon boiled milk, that they be kept as naturally as possible, that diseased and suspected cattle be isolated, that stalls and cow-houses be disinfected, and that consumptive people be kept away from cattle. The keeping of books is advocated, the following being a specimen of the milk register suggested :—

No. or name of the cow	Trial milking-days, weeks, &c. (up to 52nd)	1	2	3	4	Result of the trial milkings	Average yield of milk and of fat	Bulled	Calved	Duration of dryness	No. of days in milk in the year	Average yield of milk and of fat daily for 1 year	Total of milk with average of fat for 1 year	Remarks
I.	Milk lb.	10	8	10	,,	1,244	35·6	4/8	18/5	From 21/1 to 18/5	248	23·8	8,688	Total of trial days of milking, 35
	Fat %	3·0	3·1	3·1	,,		3·0							

[1] It is not clear what cattle the author here refers to. I have written to Mr. James Robertson, of La Mancha, Malahide, Co. Dublin, on the subject, and though he has obligingly inquired of breeders in various parts of the country, it has been without avail.—W. F.

The subjoined is the specimen of a breeding register :—

No............. Name............. Breed.............
Date and Place of Birth..
Where and from whom bought...
Colour, markings, and peculiarities..
Size and state of the udder...
Condition of the body..
Dam...............by.............
Sire ....by.............

Details of last service		Calf expected	Actually calved	Last calf			Milk production				Live weight		Remarks
Name and No. of bull	Date			Sex	Colour and markings	How disposed of	Year	Days in milk	Amount of milk	Amount of fat	Date	Stones	
									lb.	lb.			
Pascha 20	26.6.85	3.4.86	10.4.86	Bull	Black, white star on brow		1885	315	8,688	265	18.4.85	87	
							1887	326	7,924	230	10.4.86	88	

The fifth section, on the feeding and maintenance of cattle, commences by discussing the subjects of digestion and of preparation of food, followed by references to unsound food and dangerous plants. The general principles of feeding, and of pasturing and stall-feeding, also receive attention, and are accompanied by suggestions specially applicable to calves, milch cows, fatting bullocks, and working oxen.

The concluding section treats of the industrial uses of cattle, and affords opportunity for discussing the milk trade and the butter and cheese-making industries, also the business of breeding, fattening, and selling of cattle.

About one-third of the volume is occupied by a series of 136 full-page plates, illustrating the cattle of the various European breeds. Many of the drawings are well executed, and must confer upon the work an enduring value as a mirror of the cattle industry in Europe in the last decade of the nineteenth century. Shorthorns are represented by the bull *Baron Hope*, and the cow *Rose of Connaught 3rd*, though it is surprising to find the female Shorthorns exemplified by an Australian cow. The Red Polls are Mr. Garrett Taylor's *Falstaff* and *Dolly No. 2*. The Jersey cow is Mr. Joseph Brutton's *Baron's Progress*, and the Guernseys are Mr. George Long's *Emin Pasha* and *Nora III.* Devons have for their representatives two Windsor champions, the late Lord Falmouth's *Wolseley* and Sir William Williams's *Flower 2nd.* Mr. Louis Huth's *Lord Beckley 6th* and *Lilly 2nd* do duty for the Sussex breeds. Herefords are represented by the Earl of Coventry's bull *Rare Sovereign*, and by the Windsor champion cow *Rosewater*, also from the Croome Court herd. In the way of illustration, probably nothing better than this work has been produced since the publication in 1862 of *Les Races Bovines au Concours universel agricole*

de Paris en 1856, by M. Baudement, on the part of the French Government. But that was a much more ambitious work, in which some of the drawings bear the signature of Rosa Bonheur.

The present work is a companion volume to the same publisher's treatises on Sheep Breeding (Mentzel's *Shafzucht*) and Pig Breeding (Rhode's *Schweinezucht*).

AGRICULTURAL ENTOMOLOGY.[1]

Ten or a dozen years ago the subject of agricultural entomology, as a serious and profitable study, was scarcely recognised in this country. In one season one crop, and in another season another crop, would fall a victim to the attacks of insect pests, and year after year such losses were conveniently, if ignorantly, attributed to "blight." Little attempt was made to investigate the nature of this "blight," still less its cause.

In order that any substantial progress might be made in the saving of crops from the ravages of insects it was very desirable that the ideas conveyed by the term "blight" should be better defined, and indeed that the term itself should give place to others carrying more precise meanings. For such work as this a popular teacher was needed—one who would not be deterred, either by the inherent difficulties of the subject, or by the lack of enthusiasm and of public appreciation which could hardly fail to accompany the earlier efforts. It is such a teacher that the author of this volume has proved herself to be.

In 1884 Miss Ormerod published a little handbook, *A Guide to Methods of Insect Life*, of which the present work is in effect a second edition. The scheme of the book may be understood at a glance. Of the ten chapters, the first two deal with insects and insect life in general, and, aided by copious illustration, they serve to put any reader of ordinary intelligence in possession of such entomological facts and principles as can be usefully applied in coping with the ravages of insect pests. A couple of chapters are then devoted to the two-winged insects (the true flies, or Diptera), which include not only such crop-devastators as wheat midge, Hessian fly, wheat-bulb fly (fig. 1), mangel fly, onion fly, and leather jacket, but also such irritating blood-suckers as gad flies, warble flies, bot flies, forest flies (fig. 2), and others which persecute our inoffensive and defenceless farm live stock. The next two chapters deal with the extensive group of the beetles (Coleoptera, fig. 3), chief crop-destroyer amongst which is the wireworm, though its allies—the turnip fly, cockchafer, and weevils of all kinds—are also capable of doing great mischief. The succeeding chapter is concerned with the

[1] *A Text-book of Agricultural Entomology; being a Guide to Methods of Insect Life and Means of Prevention of Insect Ravage. For the Use of Agriculturists and Agricultural Students.* By ELEANOR A. ORMEROD, F.R.Met.Soc., &c. Pages xii + 238, with 163 illustrations. London: Simpkin, Marshall, Hamilton, Kent & Co. 1892.

Lepidoptera (butterflies and moths), of which the moths (fig. 4) are the more especially aggressive, as witness the ravages of winter moths

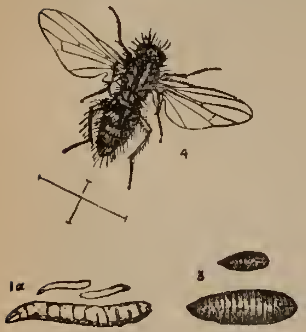

FIG. 1.—Wheat-bulb Fly, Maggots, and Chrysalids, *Hylemyia coarctata*, natural size and magnified.

FIG. 2.—Forest Fly, *Hippobosca equina*, natural size and magnified. Egg-like pupa and toothed claw, magnified.

and surface caterpillars. The destructive sawflies (Hymenoptera), with their voracious caterpillars, are discussed in chapter viii., whilst

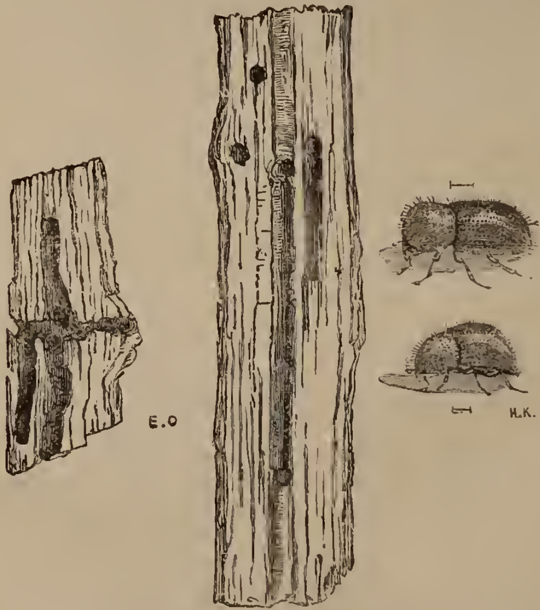

FIG. 3.—"Shot-borer" Beetle, *Xyleborus dispar*. Male (lower figure) and female (upper figure), with lines showing natural length. Plum stems, with tunnels made by the beetles.

in the following chapter the aphides or "smother flies" (Homoptera) are brought under notice. The concluding chapter is devoted to a

group of pests which, though they are anything but insects, yet seem to find an appropriate place in a volume concerned with Agricultural Entomology. They include slugs, liver-fluke, eelworms, millepedes, spiders, and mites. Our language is deficient in a word which would adequately express the contents of this book. The Germans employ the term "Pflanzenschutz" (plant-protection), but though slugs, eelworms, and millepedes might be discussed under this head, it could not be made to embrace the insect pests that prey upon farm animals.

The volume teems with sound practical advice—all based upon experience—as to the best methods of coping with insect attacks. Hence, it should find its way into every rural school and every village library. In the hands of young people it will prove particularly

FIG. 4.—Death's Head Moth and Caterpillar, *Sphinx* (*Acherontia*) *atropos*, natural size.

serviceable. By its means the comprehensive but indefinable term "blight" will tend to become obsolete, and every insect attack with which crops in field or garden chance to be smitten will be at once associated with the name of the tiny marauder which is carrying on the evil work. Recognition or identification of the pest that is causing the mischief is the first great and often indispensable step towards its suppression.

The study of insects has been a life-long occupation with Miss Ormerod. One of her earliest recollections is that of being placed in a chair to watch some large water grubs (probably the larvæ of the carnivorous water beetle, *Dytiscus marginalis*) in a glass, when to her amazement one of the creatures which had got injured was devoured by its companions. This initial observation whetted the

appetite for further knowledge of creatures which could do such dreadful things, and happily her father's Gloucestershire property (Sedbury Park, opposite Chepstow in Monmouthshire) afforded admirable opportunities for the study of plant, bird, and insect life. As her father advanced in years she undertook a considerable share in the management of the farm and the estate, and this gave to Miss Ormerod that practical knowledge of agricultural affairs which is so abundantly evidenced in her numerous writings.

About the year 1868 the Royal Horticultural Society, in conjunction with the Science and Art Department, commenced to form a collection illustrative of insects useful or injurious to cultivators, and to this Miss Ormerod for a period of ten years largely contributed, sending specimens of insects in their different stages, together with examples of injury inflicted upon timber, corn, roots, and other crops. In recognition of this work the Royal Horticultural Society awarded her the Flora Medal, and later she received silver and gold medals from the University of Moscow for her beautiful models of insect injury to plants.

A shrewd appreciation of the large amount of valuable information possessed by farmers and farm labourers, acquired by them in the field, has undoubtedly contributed much to the success which Miss Ormerod has achieved. She tapped this store of knowledge, and skilfully systematised and correlated what had previously been isolated facts—but facts none the less. She won the sympathy of the farm labourers at Sedbury, and they became her willing helpers in tracing and procuring insects and specimens of their mischief.

After her father's death Miss Ormerod conceived the idea of recording the results of sustained observations upon the ravages of insect pests on the farm and in the garden. Encouraged by Dr. Maxwell Masters, F.R.S., Editor of the *Gardeners' Chronicle*, and by the late Mr. J. Chalmers Morton, she issued in the early part of 1877 a brief pamphlet entitled *Notes for Observations on Injurious Insects.* This was sent to various persons who, it was hoped, would become observers, and the information thereby obtained was published in the autumn of the same year, thus forming the first of the annual series of valuable reports, the fifteenth of which was issued in the early part of 1892.

The number of observers rapidly increased, and the extensive outbreak of turnip fly in 1881 led Miss Ormerod to publish in 1882 her first special report. This was followed by her appointment in May, 1882, as Honorary Consulting Entomologist to the Royal Agricultural Society of England, in which capacity she made special reports, printed in the Journal, of various attacks upon crops. In 1886, she identified, for the first time in England, the presence of the Hessian fly. Wireworm, hop aphis, mustard beetle, and other pests, each in turn formed the subject of special inquiry, whilst the ruinous attacks upon cattle by warble flies were under investigation for several years.

Notwithstanding the heavy burden of consulting work, Miss

Ormerod found time to write her well-known *Manual of Injurious Insects*, now in its second edition, and a volume on *Injurious Insects of South Africa*, besides the instructive official reports which have appeared in the pages of this Journal. Some years ago she officiated as Lecturer on Economic Entomology at the Royal Agricultural College, Cirencester. She has also acted as Examiner in Agricultural Entomology since that subject was first embraced in the scheme of the Royal Agricultural Society's Senior Examinations in 1889.

The earlier volumes of the Journal record the admirable entomological work which John Curtis did for a former generation. In the same way its pages for the last eight or nine years have borne witness to the revival with which Miss Ormerod's name must ever be honourably associated, and which it is fervently to be hoped will be permanent in its effects.

It would not be right to conclude without a reference to Miss Georgiana E. Ormerod, her sister's accomplished and sympathetic associate in her work, and her affectionate and unwearying companion in her illness—an illness that unhappily compelled Miss Eleanor Ormerod to relinquish, in July last, the office she proved herself so well qualified to adorn of Consulting Entomologist to the Royal Agricultural Society.

W. Fream.

THE MICRO-ORGANISMS OF THE SOIL.[1]

Fermentation, though observed since pre-historic times, is perhaps less understood than any other process chemistry has to deal with. The exciters of fermentation are rendered exceedingly difficult of investigation, because they, like all living things, are subject to physiological—or more specially pathological—functions of life. They are so sensitive that any abnormal influence either changes their whole mode of existence, or destroys it altogether. A medium suitable to the life of one special kind is changed by it into a product which ceases to sustain it, but can nourish a lower class of organisms whereby concomitant fermentations arise, whose united effects are frequently such as to completely modify those produced by each separately; for this reason the specific actions of some ferments have either totally escaped observation or have been misconstrued. Every succeeding year brings additional proof of the important *rôle* played by these minute organisms, and to such an extent, especially, has this been the case in connection with the acquisition of available nitrogen, that there are good reasons to believe that a clearer comprehension of the action of soil ferments will dissipate all the

[1] Extracts from the address delivered by Professor Alfred Springer, M.A., Ph.D., as Vice-President of the Chemical Section at the Meeting of the American Association for the Advancement of Science, 1892. Revised by the Author.

anxiety chemists now entertain as to a gradual diminution of this nutrient so essential to plants.

To Hellriegel, Wilfarth, Wollny, Engelmann, Winogradsky, Warington, and Heräus may be attributed the most noteworthy experiments in this special line. In order to appreciate the importance of their discoveries, I propose first to give a brief historical *résumé* of the study of fermentation.

Historical Retrospect.

Owing to the antiquity of the use of alcoholic beverages, the ferments entering into their production are best known, and this, added to the fact of their being larger and thus permitting of better examination, has been the determining cause of basing investigations and deductions upon their behaviour.

The very fact that the art of cultivating the vine and making wine is attributed by the Egyptians to Osiris, the Greeks to Bacchus, the Israelites to Noah—the brewing of beer to Gambrinus—shows how old these discoveries must have been. The effects of fermentation are sufficiently striking to have called the attention of primitive man to them. The ancient tribes of Asia and Africa understood how to ferment not only grape juice, but also how to obtain alcoholic beverages from substances like starch, not directly fermentable. They used soured dough or beer-yeast as leaven for their bread, and knew how to prepare vinegar. The alchemists were wont to clothe their thoughts in such words as to make it difficult for us to decide what precise ideas they attached to the terms "Fermentation" and "Ferments," which are so frequently found in their writings of the thirteenth to the fifteenth century. They even speak of the philosopher's stone as "fermenting" unlimited quantities of lead and mercury into gold.

In the fifteenth century Basil Valentine in his *Triumphal Car of Antimony* claims that yeast employed in the preparation of beer communicates to the liquor an internal inflammation, thereby causing a purification and separation of the clear parts from those which are troubled; but considers alcohol as already existing in the decoction of germinated barley. In 1648 Van Helmont declared fermentation the cause of all chemical action and spontaneous generation, going so far as to give directions for the production of mice, frogs, eels, &c. He clearly observed the production of a special gas (gas vinorum) during alcoholic fermentation, and stated that something from the ferment passes into the fermentable substance, developing therein like a seed in the soil, thereby producing fermentation.

Willis, an English physician, in 1659 claimed that all functions of life depended upon fermentation, and that diseases were but abnormal fermentations. Both he and Stahl regarded a ferment as a body endowed with a motion peculiar to itself, which it imparts to the fermentable matter. Stahl in 1697 advanced the following theory: "Under the influence of the internal motion excited by the

ferment, the heterogeneous particles are separated from each other, recombining so as to form more stable compounds, including the same principles but in different proportions. Putrefaction is but a particular case of fermentation." This theory remained unchallenged eighty years.

Lavoisier, by applying the new methods of organic analysis he had invented, quantitatively ascertained the relations between the fermented matter and the products.

Gay-Lussac considered oxygen the sole cause of fermentation, putrefaction, and decay, by transmitting its motion to the ferment, and this imparted its motion to the loosely combined fermentable mass.

The present theories of fermentation originated with Schwann and Pasteur. It took a century and a half before the experiments which led up to Schwann's theory found a scientific explanation by the work of this chemist. Leeuwenhoeck had in 1680 already noticed that beer-yeast was composed of small spheroidal globules. Cagniard de la Tour declared yeast to be a plant, and the exciter of fermentation.

Schwann's experiments were made to determine the possibility of spontaneous generation. He found that fermentable fluids, when first heated in closed vessels in the presence of oxygen to the temperature of boiling water, would not ferment. This disproved Gay-Lussac's theory that oxygen caused fermentation. He next showed that purified air or oxygen passed into a sterilised fermentable fluid did not induce fermentation; but that this set in with the introduction of ordinary air. He concluded from these experiments that the air was not the exciter, but simply the medium containing it, and that in the floating particles of the atmosphere were organisms capable of developing in the fluid; should these be killed by heat, fermentation would not take place. In his examination of these organisms, although his methods were not absolute, his conclusions that alcoholic ferments are of a vegetable nature were correct.

Instead of general acceptance, Schwann's theory received but little recognition.

Schultze's method of first passing the air entering a sterilised fermentable fluid through oil of vitriol, and that of Schroeder and Dusch of filtering it through cotton, can be regarded as modifications of Schwann's experiments. All these experiments conclusively show that the particles in the atmosphere are the exciters of fermentation, but do not render them visible.

Pasteur, spurred on by the same motive as Schwann—namely to determine the question of spontaneous generation,—made a simple modification of Schroeder and Dusch's experiment, by substituting gun-cotton, and achieved most remarkable results. The gun-cotton, containing the particles filtered from the air, was dissolved in ether under the microscope, and now for the first time the organisms could be thoroughly examined.

Tyndall's well-known experiments, with an air-tight box coated with glycerine, demonstrated that gravity alone can purify the atmosphere so as to debar fermentation from setting in.

Pasteur's theory is that "the chemical act of fermentation is essentially a correlative phenomenon of a vital act beginning and ending with it; there is never an alcoholic fermentation without there being at the same time organisation, development, multiplication of globules, or the continued consecutive life of globules already formed."

Examples might be cited to show that the slightest changes in nutrients may render them worthless, as such, to certain ferments, and available to others.

The Micro-organisms of the Soil.

These organisms may, according to their actions, be divided into three groups:—(1) those which oxidise constituents of the soil, (2) those which reduce or destroy the same, and (3) those by whose activity the soil is enriched. As regards the first group, the oxidation can take place in two ways—they can either oxidise by assimilating the organic substances of the soil and reducing them to carbonic acid and water, in order to obtain the necessary heat and energy; or they can oxidise by giving off oxygen. The first may be termed intra-cellular, and the second extra-cellular acting organisms.

Intra-cellular Action.—Amongst the intra-cellular we have, primarily, the usual ferments of decay, which assimilate and respire at the expense of the carbon compounds. In some cases the organisms have accommodated themselves to seemingly most remarkable materials for respiration, the combustion of which affords the necessary heat. Thus the Iron Bacteria of Winogradsky require ferrous carbonate for their life and development, oxidising the same to oxide. This can be physiologically interpreted as a respiration process, the protoxide of the respiration material becoming the oxide of respiration product.

The Sulphur Bacteria are equally remarkable. Their cells are distinguishable by containing from time to time granules of amorphous sulphur. These organisms were formerly regarded as causing the formation of sulphuretted hydrogen in sulphur springs.

Winogradsky claims the reverse to be the case. They do not produce sulphuretted hydrogen but consume it, burning it partially first to sulphur (which deposits in the cell) and water, then completely to sulphuric acid, which passes out and forms sulphates from the carbonates of the surrounding water. When no more carbonates are present, the combustion of sulphur to sulphuric acid ceases. Physiologically this is also a process of respiration directed towards generating heat and energy; sulphuretted hydrogen is the respiration material and sulphuric acid the respiration product.

Certain nitrification ferments can be regarded as intra-cellular. They may take up ammonia and give it off as nitrates, this process ceasing, as in the case of the Sulphur Bacteria, when no more carbonates are present.

We now come to the discussion of two ferments, the concomitant actions of which have heretofore caused much confusion. Schloesing

and Muntz were the first to observe nitrifying ferments, but to Warington and Winogradsky belongs the credit of isolating the nitrous from the nitric ferment; furthermore, the striking discovery of a colourless organism, capable of existing and performing its functions in a medium totally devoid of organic material, and synthetically producing organic bodies independent of sunlight. The importance of this discovery cannot be over-estimated.

Warington succeeded in obtaining organisms from meadow soil, cultivated in a solution of ammonium chloride and calcium carbonate, which oxidised ammonia to nitrous acid, but had no effect on nitrates. Assimilating the carbon of the carbon-dioxide, they require no organic substance for sustenance. They obtain from the oxidation heat of ammonia the necessary energy to dissociate or break up the carbon-dioxide.

Winogradsky obtained the same ferment, employing 1 gramme ammonium sulphate, 1 gramme potassium phosphate, dissolved in 1 litre Zurich water, to which he added basic magnesium carbonate. After inoculating the sterilised fluid with the nitrifying agent, every trace of ammonia disappeared the fifteenth day. He describes this ferment as being in shape an elongated ellipsoid. The organisms congregate about a piece of carbonate, cover it with their gelatinous mass, and as the carbonate disappears the cells take the shape thereof.

Although the two investigators do not quite agree as to the morphological attributes of the ferment, Warington arrived at the same conclusions as Winogradsky.

Winogradsky has at last succeeded in isolating the ferment which converts the nitrites into nitrates. He employed gelatinous hydrate of silica, and impregnated it with a fluid containing the cultivated nitrous ferment. This medium was next inoculated with strongly nitrifying soil from Quito; shortly afterwards two different organisms formed respective colonies, one of which was the one sought for. It was composed of irregularly shaped rods, dissimilar to the nitrous ferment of the same soil. He has since found this ferment in many other soils; it is capable of converting solutions of nitrites into nitrates.

Strange to say the isolated ferment from Quito does not oxidise ammonia; it produced neither nitrites nor nitrates when sown in ammoniacal fluids, easily nitrified by the nitrous ferment.

In normal soils the nitrate ferment only produces nitrates even in the presence of a large quantity of ammonia, which does not retard the oxidation of the nitrites immediately after their formation.

Muntz claims the existence of an ammoniacal ferment in the soil which converts organic nitrogen into ammonia, preparatory to nitrification.

Extra-cellular Action.—In order to oxidise outside of the organisms, oxygen must be evolved by an assimilation process. Assimilation as an oxidising cause, for conditions prevailing in the soil, has heretofore attained no significance, since the evolution of

oxygen, according to the generally accepted theories, depended upon light and chlorophyll; consequently the produced oxidation could only occur on the extreme outer surface. An exception to this heretofore unrestricted rule has been found by Engelmann, as well as one by Heräus. According to Engelmann, *Bacterium photometricum* sharply discriminates between lights of different intensity and wave lengths. The influence of light upon the bacteria is directly proportionate to the intensity. When the intensity is suddenly decreased, the bacteria shoot backwards with opposite rotation (the author calling this a terror motion), consequently a well-defined illuminated spot in an otherwise dark drop serves as a trap for these bacteria. They cannot leave, since the terror motion causes them to move back into the illuminated field as soon as they come to the dark outline.

The mobile forms principally congregate in the ultra-red rays of solar light, i.e. physiologically in darkness, and in them—as in the visible parts of the spectrum—in places closely corresponding to what are known to physicists as the absorption bands of bacterio-purpurin. This constant ratio between absorption and photo-kinetic action clearly indicates that the prime effect of light is equivalent to the carbon-dioxide dissociating processes of plants containing chlorophyll.

The bacterio-purpurin is a true chromophyll, inasmuch as it converts the actually absorbed energy of light into potential chemical energy. When lights of different colour were employed, the evolution of oxygen increased with the absorption of light by the purple bacteria. This shows that the power of developing oxygen is not the specific property of a certain colouring matter, as the organisms contain no chlorophyll.

It is not surprising, therefore, that other organisms, either coloured or uncoloured, are found to possess the property of assimilating carbon in the absence of light, and evolving oxygen. Such a discovery has now been made—Hueppe substantiating a communication from Heräus that certain colourless bacteria produce from humus and carbonates, in the absence of light, a body closely resembling cellulose. Oxygen is liberated, but remains unobserved, as it is immediately used to convert the ammonia by oxidation into nitric acid.

The next question is: To what extent do the oxidising organisms partake in the oxidation phenomena actually occurring in the soil? According to E. Wollny the oxidation of carbon dioxide is almost completely to be attributed to the activity of small organisms, of which Adametz estimated that there are about 500,000 to 1 gramme ($=15\frac{1}{2}$ grains) of soil. As in all such experiments, this conclusion is based upon the fact that no evolution of carbon dioxide takes place, or if it does occur it is forced to a minimum, in a sterilised soil under otherwise favourable conditions.

Liberation of Combined Nitrogen.

This may take place during putrefaction under the greatest possible exclusion of oxygen, or during decay in the presence of

oxygen. It does not necessarily occur in all cases, or may not be observed owing to a reverse concomitant process, i.e. the fixation of nitrogen. Nitrogen losses can be expected during decay, on account of the action of the produced nitrous acid upon the amide-like dissociation of humous bodies, as well as in the formation of easily dissociable ammonium nitrites. A peculiar case of the disappearance of available nitrogen exists in the reduction of nitrates, as noticed by the author, by Gayon and Dupetit, and by Dehérain and Marquenne.

Organisms by whose Activity the Soil is Enriched in Nitrogen.

A distinction must be drawn between the higher and lower plants. It is a well-known fact that most plants cannot assimilate free nitrogen ; whereas there are sound reasons for the belief that leguminous plants [1] are exceptions to this rule. The explanation has been sought in the root-nodules.[2] These nodules contain a tissue, consisting of thin-walled cells filled with an albuminous substance, consequently they are richer in nitrogen than the roots ; they have been regarded by some as pathogenic (i.e. disease-producing) growths, by others as reserve stores for albumin. We may now conscientiously assume that these nodules arise through exterior infection, and that they are not normal growths.

Hellriegel and Wilfarth, in their great work upon this subject, state :—"The leguminous plants deport themselves quite differently from the non-leguminous plants respecting the assimilation of nitrogen, the latter being totally dependent for their nitrogen needs upon the nitrogen compounds present in the soil, and their development being proportional to such disposable supply. The leguminous plants have, besides the soil nitrogen, a second source from which they can abundantly cover any deficiency existing in the first. This second source is free atmospheric nitrogen. The leguminous plants attain this power by the co-operation of active living micro-organisms. The mere presence of low organisms in the soil does not suffice to make the free nitrogen serviceable, but it is necessary that certain kinds of organisms enter into a symbiotic relationship with the leguminous plants."

Lupins acquire nitrogen like the other leguminous plants. They starve in a soil free from nitrogen, when the presence of low organisms is excluded ; but when this is not the case their growth

[1] "Légumes" is the word used by the author, but inasmuch as this is the French word for "vegetables," whilst in England the word *legume* is used to denote the fruit (the *pod*) of beans, peas, vetches, clover, &c., it has been deemed expedient to speak of "leguminous plants" throughout, so as to avoid confusion or misunderstanding.—Ed.

[2] "Tubercles" is the word used by the author, but as it is suggestive of the *disease* termed tuberculosis in animals, the less objectionable word "nodules"—employed in the Rothamsted memoirs—has been substituted in every case.—Ed.

is normal. The experiments were carried on in sand containing a suitable nutritive solution. Some of the pots were sterilised ; to others infusions from soil were added. In all those, and in only those, to which fresh infusions of lupin soil had been added the lupins developed normally, bearing the well-known nodules on their roots, and contained, when harvested, conspicuously larger amounts of nitrogen than the soil and infusion could have given them. Wherever the infusion had not been added, or where it had been sterilised at 212 deg. or even 160 deg. F., the development remained abnormal, the production scanty : nodules continued absent and the harvested plants contained less nitrogen than had been offered them.

According to Ward, Breal, and Prazmowski, nodules will grow on plants free from them when infected with an infusion from nodules of other plants.

Beyerinck has named the infecting organisms, of which there may be many varieties, *Bacterium radicola.* With the growth of the nodules the behaviour of the plant towards nitrogen is changed, and the just mentioned independence begins ; this has been proved by an almost superabundance of experiments. Still the explanation of the manner in which the nitrogen is acquired is not definitely settled. The first inference would be that the root-inhabiting bacteria possess the power of assimilating atmospheric nitrogen, and that the higher plants as hosts, harbouring these bacteria in their roots, use the nitrogen compounds so produced. Thus there would exist a case of symbiosis (literally, *a living together*) between Split Fungi (*Schizomycetes*) and the higher plants. We cannot be too slow in accepting this seemingly simple explanation ; still the difficulty of a correct interpretation does not alter the fact that the leguminous plants acquire free nitrogen from the atmosphere, and that the refuse of their roots thus enriches the soil. They may be called nitrogen-collectors, in contradistinction to the gramineous nitrogen-consumers.

Berthelot has long contended that the free soil can "fixate" nitrogen. He considers a sandy and clayey nature of the soil essential ; it must admit of free access of air, must not be too moist, and must be rich in potash and poor in nitrogen. Gautier and Drouin claim that the presence of humous substances causes increase of nitrogen.

Soils free from organic substances do not fixate nitrogen, or the gain is slight. The presence of ferric oxide, so long considered capable of fixing nitrogen, has no effect. Berthelot, as well as most investigators in this line, attributes the fixation to the activity of nitrogen-fixing chlorophyll-free bacteria. In most cases the amount is much less than that obtained in soils with leguminous plants. No inorganic soil constituents are known to possess the power of fixing nitrogen, and it is questionable whether humous substances can directly do this.

In 1881 Atwater claimed that peas during their growth obtained large quantities of nitrogen from the air. Atwater and Woods made another series of eighty-nine experiments ; the result is recorded in their admirable paper in the *American Chemical Journal.*

I will quote the following :—" There was in no case any large gain without root-nodules ; but with them there was uniformly more or less gain of nitrogen from the air. As a rule, the greater the abundance of root-nodules, the larger and more vigorous were the plants, and the greater was the amount of atmospheric nitrogen acquired. The connection between the root-nodules and the acquisition of nitrogen, which was first pointed out by Hellriegel, is abundantly confirmed. In a number of these experiments, there was a loss of nitrogen instead of a gain. The loss occurred where there were no root-nodules ; it was especially large with oat and maize plants, and largest where they had the most nitrogen at their disposal in the form of nitrates. This loss may probably be due to the decomposition of the seeds and nitrates through the agency of micro-organisms. In brief, the acquisition of large quantities of atmospheric nitrogen by leguminous plants, which was first demonstrated by experiments here, and has been since confirmed by others, is still further confirmed by the experiments herewith reported. These experiments in like manner confirm the observation of the connection between root-nodules and the acquisition of nitrogen. There is scarcely room for doubt that the free nitrogen of the air is thus acquired by plants."

Chemists, as a rule, hesitate to accept isolated cell life as modifying and conditioning the action of cells more differentiated ; yet it seems that all circumstances point to the fact that most reactions taking place between nitrogen and plants are influenced by micro-organisms.

Let us hope that the science of chemistry will, in the near future, score the greatest of its agricultural triumphs, by unveiling the mysteries which still shroud the specific actions of these minute organisms.

ALFRED SPRINGER.

DISHORNED CATTLE.

To the Editor of the JOURNAL.

Sir,—An article in *The Times* of September 22, 1892, dealt with this subject at some length. It is one, I think, of more importance than is generally conceived.

The practice of dishorning full-grown cattle by sawing off their horns seems a cruel and needless one, as the object can be attained in another way. The horns should not be allowed to grow, and the growth can be easily stopped by the application of a red-hot iron, or of caustic potash, at the time when the horn is just pushing through the skin.

For some time I have adopted this method myself, with the result that the stock so treated are quieter, and take nothing like the shed and manger room they otherwise would require ; while very serious loss and pain are avoided, especially in dairy herds,

where goring, or "polching," as it is termed, frequently leads to partial or total loss of milk.

The red scores and wounds on the hides of cows bear constant witness to the treatment that sort of stock receive at each other's horns.

In the transit of cattle by rail I find that one or two more beasts will go in a truck without their horns than with them, and at the same time a polled beast has a better chance, should he get down in a truck, of getting on his legs again.

I have had some correspondence from different parts of the country on this subject, and from among it I will add the opinion of two friends of great practical experience.

Mr. Clare Sewell Read, of Honingham Thorpe, Norfolk, says:—

"You ask for my experience in winter grazing polled and horned cattle in covered yards. In the first place you can stow quite 50 per cent. more polled than horned cattle in the same space. We bother our landlords to provide us with shelter for our grazing bullocks, and then two humane Judges prevent us from making the best use of that shelter. In Norfolk we graze a large number of Irish cattle. You pick out thirty on Norwich Hill, and possibly these thirty bullocks were bred on thirty different farms in Ireland. You turn these strange cattle into a confined space from which there is no escape, and all their Celtic animosities are aroused. So after a free fight of many weeks the weaker give way to the stronger, and they cower in the windy corner of the yard, while the master bullocks eat up all the meal and cake that should be theirs. Dishorn the lot, and peace and quietude reign supreme, whilst they will feed as happily together as so many pigs!"

Mr. Westley Richards, of Ashwell, Rutland, writes:—

"In answer to your inquiry about dishorning cattle for grazing purposes, I have no hesitation in saying that dishorning appears to alter the character of the cattle; they rest better and feed better. All the Shorthorns I have brought from Ireland the last two or three years have been dishorned. I think butchers appear to prefer dishorned cattle, as they are not bruised in the same way that horned cattle frequently are. For cattle that have to be kept in yards, it is absolutely necessary that they should be dishorned if they are to get their proper share of food and shelter."

I am, Sir,
Yours faithfully,
ALBERT PELL.

Nov. 5, 1892.

ADULTERATION OF MANURES AND FEEDING STUFFS.

ON March 11, 1892, a Departmental Committee of the Board of Agriculture was appointed to inquire into and report upon the alleged Adulteration of Artificial Manures, and Fertilisers, and Feeding Stuffs used in Agriculture. The Committee consisted of the Hon. J. S. Gathorne Hardy, M.P. (Chairman), Sir Jacob

Wilson, Dr. James Bell, C.B., F.R.S., Mr. J. F. Rotton, Q.C., Mr. F. A. Channing, M.P., Mr. Peter McLagan, M.P., and Mr. Albert Pell. Amongst the documentary evidence laid before the Committee was a Memorandum, prepared by the Chemical Committee of the Council of the Royal Agricultural Society, on the action taken by the Society for the repression of the adulteration of manures and feeding stuffs. This Memorandum is printed in full in the present volume of the Journal (Vol. III., 3rd series, Part II., pp. 349-353).

The Report[1] of the Committee, dated October 27, 1892, issued in the form of a Blue Book, states that while no very reliable statistics are available as to the quantity of home-manufactured manures consumed in the United Kingdom, members of the trade estimate the consumption at about 570,000 tons [presumably per annum].

The quantities and values of manures and fertilisers imported into the United Kingdom from abroad in the five years, 1886-1890, were as follow :—

Year	Quantity	Value
	tons	£
1886	417,133	1,475,737
1887	431,066	1,166,237
1888	451,441	1,207,419
1889	484,731	1,335,856
1890	523,835	1,510,122

The above figures do not include the imports of nitrate of soda (which is entered in the Customs Returns as cubic nitre), nor those of sulphate of ammonia.

The prices at which manures are sold are supposed to be based upon their fertilising ingredients, viz., phosphoric acid, nitrogen, and potash. There is a preponderance of evidence to the effect that a considerable amount of fraudulent dealing (especially in the case of compound manures) exists, and that there is a system of selling unguaranteed and comparatively worthless articles at an excessive price. These frauds, however, are less practised than formerly, and have a tendency to diminish. In view of this state of things, the Committee express the opinion that, in the interests of agriculture, some legislation is desirable, which shall render it more easy for the purchaser to ascertain the real value of the article he is being supplied with.

The term "feeding stuffs" is employed to comprise all the various kinds of cakes and meals used for feeding stock, including linseed cakes, cotton-seed cakes, rape-seed cakes, mixed cakes, compound cakes, feeding cakes, wheat meal, barley meal, oatmeal, and

[1] *Report of the Departmental Committee appointed by the Board of Agriculture to inquire into the Adulteration of Artificial Manures, and Fertilisers, and Feeding Stuffs used in Agriculture: with Minutes of Evidence and Appendices.* Pages xx + 164. London: Eyre and Spottiswoode, 1892. [C.—6742.] Price 1*s*. 6*d*.

a variety of proprietary articles and compounds sold as calf meal, milk food, lamb food, dairy cow meal, &c.

The consumption of oil-cakes in the United Kingdom is estimated at 650,000 to 700,000 tons per annum. A large proportion of this quantity is made up of oil-cakes imported from abroad.

The following are the imports of oil-cakes and oil seeds into the United Kingdom for the years named :—

Imports of Oil-cakes.

Year	Quantity	Value
	tons	£
1887	264,849	1,555,881
1888	257,748	1,607,263
1889	255,918	1,701,106
1890	282,616	1,743,279
1891	270,671	1,843,285

Imports of Oil Seeds.

Year	Linseed	Cotton-seed	Rape-seed
	quarters	tons	quarters
1887 . .	2,299,123	275,627	382,487
1888 . .	2,533,540	257,172	277,727
1889 . .	2,269,495	277,394	449,250
1890 . .	1,933,165	314,050	230,547
1891 . .	2,200,112	350,437	261,169

The evidence shows that the trade in oil-cakes is a field in which the practice of adulteration is particularly prevalent, and that there is a large quantity of articles more or less impure or adulterated sold as genuine or pure products.

The adulterants used in the manufacture of linseed cakes are known in the trade under the name of *buffum*. Under this most comprehensive term are included such substances as corn flour extract, saccharum meal, bran, rice-meal fannings, ground-nut cake, niger cake, ground and dried olive refuse, the husks of various kinds of grain, and cocoa-nut fibre.

Poisonous seeds have occasionally been found in linseed cakes. Cattle have been killed, or injured, by croton seed and castor-oil seed in linseed cakes, or by eating cotton-seed cakes made from seed which had been imperfectly ginned or cleared of the lint adhering to it.

Cakes of inferior quality, and what may, perhaps, be called impure cakes, are sold under the name of "oil-cakes." The Committee are convinced that to authorise in any way the use of the term "oil-cake," as descriptive of mixed cakes, would only facilitate fraud, because it has become a general habit among farmers to use this term as synonymous with "linseed-cake." It would be safer to use the term "mixed," but it would be most desirable that some definite

term to serve as a legal description of cakes and feeding stuffs made of inferior materials should be devised, which should distinguish these cakes from pure cakes.

The following are the recommendations made by the Committee :—

I. Recommendations as to Manures.

"(*a*) That all home-manufactured artificial manures and fertilisers, both simple and compound, should be sold with a guaranteed analysis in writing stating the percentages of fertilising ingredients.

"(*b*) That all imported artificial manures and fertilisers be sold with a copy of the import analysis, and that such import analysis be, within reasonable limits, binding on the seller.

"(*c*) That the Board of Agriculture should issue clear and simple instructions for taking samples, and that no sample be taken for analysis except after due notice to the vendor, that he may be present by himself or his agent.

"(*d*) That where there is any deficiency in any of the items guaranteed, the vendor shall be held liable upon civil proceedings to pay the purchaser, in compensation, the value of the article deficient, setting against it, however, the valne of any item which may be in excess of the guarantee.

"(*e*) That any deficiency due to fraud be made an offence punishable upon summary conviction by fine or imprisonment.

"(*f*) That no criminal prosecution be undertaken unless it is the opinion of an analyst appointed by the Board of Agriculture, or an analyst authorised by them to act for this purpose, that the case is one for such proceedings to be taken.

"(*g*) That the Board of Agriculture, county councils, agricultural societies, chambers of agriculture, farmers' clubs, co-operative societies, and like bodies be empowered, if they think fit, to institute prosecutions under this clause."

II. Recommendations as to Feeding Stuffs.

"(*a*) That all simple feeding cakes composed of one substance or the product of one seed, and called after the name of such substance or seed, be required to be sold under the distinctive name of such substance or seed, and be thereby guaranteed 'pure and suitable for feeding purposes.'

"(*b*) That all other cakes be sold as mixed or compound cakes, or by some designation fixed by the Board of Agriculture ; but this should not exclude the use of any trade description or fancy name for such cakes, provided that one of the two words 'mixed' or 'compound' or some other term to be fixed by the Board of Agriculture be affixed to such trade description or fancy name.

"(*c*) That the presence of deleterious ingredients in any article sold for feeding stock be prohibited under a penalty.

"(*d*) That the addition of any worthless material undeclared in

any article sold for feeding stock be treated as an offence subject to a penalty.

"(*e*) That any guarantee or analysis voluntarily given be binding on the vendor.

"(*f*) That the same penalties apply in the case of feeding stuffs as of manures, and that clauses (*f*) and (*g*) of the recommendations in regard to manures apply to feeding stuffs."

RECENT AGRICULTURAL INVENTIONS

The subjects of Applications for Patents from Sept. 19 *to Dec.* 10, 1892.

N.B.—Where the Invention is a communication from abroad, the name of the Inventor is shown in italics, between parentheses, after the name of the applicant.

Agricultural Machinery and Implements, &c.

No. of Application.	Name of Applicant.	Title of Invention.
16816	RANDALL, A. H.	Machine cutters for roots.
17337	FOOTE, A. C. G.	Threshing machines.
17396	BAMLETT, A. C.	Harvesters.
17552	FARQUHARSON, D. B.	Potato digger.
17573	ALDRITT, F.	Drying corn.
17620	HILLIER, C.	Machine for collecting and loading hay, &c.
17952	MAXWELL, B.	Potato digger.
18115	KOLL, H.	Chaff-cutting machine.
18182	BENTALL, E. E.	Turnip cutters.
18573	SPENDLOVE, T.	Hay-tedding machines.
18574	GRETTON, J.	Loading and carting hay, &c.
18640	BAWDEN, R.	Plough-shares.
18650	DOCTOR, C.	Distributing, &c., artificial manure.
18907	LAPLAZA, G. G.	Reaping machines.
18922	HOWARD & GIBBS	Straw-trussing machine.
19334	TOPP, G. C.	Reaping and mowing machines.
19503	SARGEANT, T. C.	Sheaf-binding harvesters.
19542	THOMPSON (*Cordes*)	Straw trussers and binders.
19903	GRIFFIN, H.	Hay-rakes.
20184	FORMAN, H.	Ploughs or cultivators.
20622	MEINHAUSEN, W.	Drill-ploughs.
20857	MAYNARD, R.	Elevating apparatus of portable combined chaff-cutter.

No. of Application.	Name of Applicant.	Title of Invention.
21033	Bomford, B.	Ploughs.
21150	Marshall, J.	Threshing machines.
21201	Smith & Hibbert	Machine for collecting hay, &c.
21402	Meggeson, T. A.	Sowing artificial manures, &c.
21470	Newell, D. R.	String holding attachment for binding and reaping machines.
21553	Knapp, L. R. & T. E.	Seed and manure drills.
21625	Stäge, F. & A.	Threshing machines.
21644	Carl, K.	Ploughs.
21685	Cashmore & Charlesworth	Combined root and chaff-cutting machine.
21726	Hornsby & Innocent	Sheafbinding harvesters.
21779	Cameron, J.	Sifting, separating, and delivering potatoes.
21848	Rowell, D.	Covering for ricks.
22040	Brown, I.	Apparatus for preparing land for seed, &c.
22296	Kuxmann, H.	Seed and manure-distributing machine.
22470	Blyth, S. W.	Pressing hay, straw, &c.
22587	Lambert, G. & others	Plough coulter.
22750	Nalder and others	Threshing machines.
22755	Badertscher, J.	Scythes.

Stable Utensils and Fittings—Horse-shoes, &c.

16679	Horsley & Webb	Flexible linings for harness.
16732	Davies, N. W.	Horse-shoes.
16813	Wensley, J. M.	Feeding apparatus for horses.
16835	Barker, R. W. (*The Economic Feed Bag Co., U.S.A.*)	Nose-bags.
16984	Anvers, R. D.	Nailless horse-shoes.
16985	Huth, Max	Bandage for use with neck and breast collars.
16988	Bailey, J.	Horse-clippers.
17037	Mason, J. H.	Horse-collars.
17136	Hughes, E. T. (*Bonneau and Fieux, France*)	Horse-shoes.
17217	O'Brien, J.	Horse-shoes.
17218	Davis & De Rigaud	Saddle bows, dumb jockeys, &c.
17343	Kerr, W. A.	Collars, saddles and harness pads.
17344	" " "	Horse-shoes.
17493	Bishop, A. E.	Harness.
17569	Thurman, J. E.	Halters.
17650	Stewart, W.	Inflating horse-collars, &c.
17659	Lake (*Covell, U.S.A.*)	Fastenings for horse-shoes.

No. of Application.	Name of Applicant.	Title of Invention.
17750	CAMPBELL, C. .	. Harness.
17772	MORRIS, A. E. .	. Side saddles.
17849	MEYER, C. H. .	. Instantaneous horse-releasing pole and grab.
17954	VAUGHAN, T. & A.	. Frost studs for horse-shoes.
18033	NYE, H. R. . .	. Horse-holders.
18612	HULBERT, C. B. .	. Horse-shoes.
18635	LOVELY, R. . .	. Horse-collars.
18924	BENISON & BEST .	. Ante-pulling bit.
19149	GARNETT, J. .	. Horse-shoes.
19466	YEADON, A. J. .	. Horse-shoes.
19493	SMITH & SPITTLE	. Attachment of studs to horse-shoes.
19537	BARRY, J. H. .	. Horse-shoes.
19565	SIMPSON, W. S. .	. Horse-shoes.
19854	THOMAS, J. A. .	. Mechanical horse feeder.
19869	RUDD, W. . .	. Safety stirrup.
20236	CLIFFORD, H. .	. Safety appliance for attaching stirrup leathers to saddles.
20335	CHAUVIN, L. .	. Stopping runaway horses.
20837	SCRUTTON, C. .	. "Pneumatic" air collar.
21022	MUIR, W. . .	. Appliance for singeing horses.
21347	LABELLE . .	. Bearing-rein holding device.
21528	MAGINN, J. & F. .	. Horse-shoes.
21567	JENKINSON, & others	. Riding saddles.
21778	CARTER, J. . .	. Safety stirrups.
21875	LAVENDER, G. L. .	. Blocked suspension riding saddle.
21942	SCHAEFER, A. J. .	. Preventing horses attached to carts falling or running away.
21985	LEE, J. . . .	. Waterproof covers for horses.
22017	SHELDON, C. E. .	. Curb-bits.
22343	HILL, J. . .	. Frost studs for horse-shoes.
22371	CAIN, C. T. . .	. Breast collars.
22378	HUGHES, F. . .	. Horse-collars.
22414	BUSHELL, J. G. .	. Socket for self-adjusting leaping head of side-saddles.
22462	ORPWOOD, W. L. .	. Horses' fetlock boots.
22463	,, ,, ,, .	. Bits for pulling horses.
22464	,, ,, ,, .	. Riding and driving reins.
22612	PEACOCK, F. . .	. Roughing horse-shoes.
22674	BARRY, J. H. .	. Horse shoes and pads, &c.
22698	JACKSON, R. L. .	. Horse-shoe.

Carts and Carriages.

No. of Application.	Name of Applicant.	Title of Invention.
17431	STEWART, W. . .	Carts.
17432	" " . .	Attaching shafts of carts to the clogs.
18653	CAHN, I. . . .	Brakes for road carts, &c.
19345	TAUTAIN, G. X. . .	Carriage shafts.
19487	SMITH, N. & HAYDOCK .	Wheels.
20023	HALKETT, J. C., Junr. .	Adaptation of wheels or rollers to two-wheeled carriages for preventing accidents.
20823	FREEMAN, T. . .	"Sulkeys" and road carts.
21719	ROBERTSON, J. . .	Dog-cart hinge.
22305	ROWE, G. . . .	Apparatus for tipping carts, &c.

Dairy Utensils, &c.

17179	THE PRINCESS CO. LIM. .	Churns.
18071	ROEBELEN, A. . .	Butter-making apparatus.
18072	DAVIES and BAKER (*Nielsen, Denmark*) .	Milking machine.
18110	TAYLOR, E. . . .	Vessels for churning.
18792	SANTO, A. . . .	Locks for milk cans.
19257	CAMERON, D. (*Windle, U.S.A.*) . . .	Milk cans.
22189	LEGAY, G. C. . .	Sterilisation of milk.
21888	BARKER, G. (*Kneeland*).	Butter packages.
22386	DUNCAN, J. H. H. .	Butter-making apparatus.
22477, 22478, 22479	PETT, J. H. . . .	Barrel churns.
22749	NUTTALL, T. . .	Neutralising acid in milk for cheese-making.

Poultry and Game, &c., Appliances.

17970	CLOUGH, P. . . .	Incubators.
18152	CHARLAN, T. . .	Foster mothers, &c.
18429	BATSFORD & WERNER .	Drinking fountains for fowls.
18440	COLLINGWOOD, J. .	Coops.
19991	MORANT, G. F. . .	Movable game and poultry pens.
21113	ROBERTS, J. H. & J. F. .	Mechanical egg-turning incubator
21391	WEBB, R. . . .	Incubators.
22144	DERVILLES, J. . .	Incubator.
22435	BADEN-POWELL, B. F. S.	Timing carrier pigeons.

Miscellaneous.

No. of Application.	Name of Applicant.	Title of Invention.
17959	CRAIG, R. F.	Cropping and shearing machine.
18284	BAIRSTOW & NICHOLS	Muzzles for dogs, &c.
18290	CHAPMAN, F. (*Massey, New South Wales*)	Apparatus for clipping and shearing.
18675	FLETCHER, W.	Troughs for animals.
18720	BLAKE, W.	Machine, &c. for dipping sheep.
19087	WEBBER, W. & anr.	Making compressed foods for cattle.
19437	KING, H.	Cotton-seed and linseed-cakes.
19777	NEWALL, J. W.	Sheep-shearing machine.
20511	BURGON, C. & H.	Clipping and shearing apparatus.
20600	MANN, J.	Ointment for foot-rot in sheep.
20782	ADAMS, M. A.	Storing and keeping hops.
21466	CONSER & HAUSAM	Bee-hives.
21710	BLAND, H.	Sheep-shearing machine.
21797	DRINKWATER, J. C. & W. L.	Parturition shears for veterinary purposes.
21923	DAGGETT, H. S.	Shearing machine.
21415	OATES & GREEN, LTD.	Fastenings for earthenware mangers for attaching animals.

Numbers of Specifications relating to the above subjects Published since September 19, 1892.[1]

Specifications of 1891.

16050, 16891, 17061, 17248, 17644, 17894, 18594, 18932, 18978, 19063, 19082 19133, 19460, 19890, 20208, 20250, 20347, 20507, 20555, 20684, 20889, 20989, 21525, 21584, 21619, 22065, 22228, 22397, 22739, 22822.

Specifications of 1892.

87, 99, 117, 269, 806, 3109, 3495, 4635, 6126, 7244, 10266, 10849, 11510, 1153 , 12060, 12945, 13151, 13641, 13646, 13671, 13739, 13976, 14207, 14649, 14797, 14884, 15073, 15129, 15622, 15735, 15978, 16006, 16028, 16147, 16835, 16984–5, 17630, 17696, 17750.

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[1] Copies (price 8*d.* each, post-free) may be obtained at the Patent Office (Sale Branch), 38 Cursitor Street, London, E.C.

TABLE I.—*Acreage under each kind of* Crop, Bare Fallow, *and* Grass *as returned upon June* 4 *in the Years* 1892 *and* 1891 *in Great Britain, with Total for the United Kingdom.*

		Great Britain 1892	Great Britain 1891	United Kingdom, including Isle of Man and Channel Islands 1892	United Kingdom, including Isle of Man and Channel Islands 1891
		acres	acres	acres	acres
Total Area of Land and Water		56,742,508	56,742,508	77,642,099	77,642,099
Total Acreage under all Kinds of Crops, Bare Fallow, and Grass (*a*)		32,685,550	32,918,514	47,977,903	48,179,473
Corn Crops.	Wheat	2,219,839	2,307,277	2,298,607	2,392,245
	Barley or Bere	2,036,810	2,112,798	2,220,243	2,298,978
	Oats	2,997,545	2,899,129	4,238,036	4,128,127
	Rye	48,103	46,640	61,392	60,148
	Beans	311,310	354,702	315,413	359,039
	Peas	194,424	204,277	195,010	204,972
	Total	7,808,031	7,924,823	9,328,701	9,443,509
Green Crops.	Potatoes	525,361	532,794	1,276,835	1,296,763
	Turnips and Swedes	1,937,163	1,918,535	2,245,998	2,227,050
	Mangel	361,235	354,704	413,334	406,930
	Cabbage, Kohl Rabi, & Rape	150,992	156,891	198,895	207,260
	Vetches or Tares	198,678	228,258	204,399	234,210
	Other Green Crops	96,148	106,387	127,654	138,440
	Total	3,269,577	3,297,569	4,467,115	4,510,653
Clover, Sainfoin, and Grasses under Rotation.	For Hay	2,135,362	2,130,124	2,772,065	2,738,170
	Not for Hay	2,537,440	2,586,458	3,201,391	3,276,867
	Total	4,672,802	4,716,582	5,973,456	6,015,037
Permanent Pasture or Grass. *Not broken up in Rotation.* (*b*)	For Hay	4,489,626	4,503,108	6,018,308	5,973,489
	Not for Hay	11,868,524	11,930,742	21,515,018	21,593,639
	Total	16,358,150	16,433,850	27,533,326	27,567,128
Flax		1,421	1,801	72,065	76,477
Hops		56,259	56,145	56,259	56,145
Small Fruit		62,148	58,701	(*c*) 62,547	(*c*) 59,122
Bare Fallow or Uncropped Arable Land		457,162	429,040	484,434	451,402

(*a*) Not including nursery grounds, woods, and plantations, or *unenclosed* mountain and heath land.

(*b*) Exclusive of *unenclosed* mountain and heath land.

(*c*) Not returned in Ireland.

TABLE II.—*Number of* **Horses, Cattle, Sheep,** *and* **Pigs,** *returned upon June 4 in the Years* 1892 *and* 1891, *with Total for the United Kingdom.*

		Great Britain 1892	Great Britain 1891	United Kingdom, including Isle of Man and Channel Islands 1892	United Kingdom, including Isle of Man and Channel Islands 1891
		No.	No.	No.	No.
Horses.	Used solely for Agriculture	1,026,971	1,022,936	(a) —	(a) —
	Unbroken Horses .	424,237	401,257	(a) —	(a) —
	Mares kept solely for breeding	66,874	64,210	(a) —	(a) —
	Total	1,518,082	1,488,403	2,067,549	2,026,170
Cattle.	Cows and Heifers in Milk or in Calf	2,650,891	2,657,054	4,120,451	4,117,707
	Other Cattle. 2 Years and above	1,666,706	1,504,649	2,719,615	2,473,808
	Other Cattle. Under 2 Years .	2,627,186	2,691,118	4,679,351	4,752,171
	Total	6,944,783	6,852,821	11,519,417	11,343,686
Sheep.	1 Year old and above . .	17,957,049	17,786,941	20,881,837	20,614,807
	Under 1 Year old . .	10,777,655	10,945,617	12,760,971	12,919,181
	Total	28,734,704	28,732,558	33,642,808	33,533,988
Pigs		2,137,869	2,888,773	3,265,898	4,272,764

(*a*) Not separately distinguished.

Table showing the Estimated Total Production of **Hops** *in the Years* 1892 *and* 1891, *with the Acreage and Estimated Average Yield per Statute Acre, in each County in England in which Hops were grown.*

Counties	Estimated total produce 1892	Estimated total produce 1891	Acreage 1892	Acreage 1891	Estimated average yield per acre 1892	Estimated average yield per acre 1891
	cwt.	cwt.	acres	acres	cwt.	cwt.
Berks . . .	65	77	10	11	6·50	7·00
Gloucester . .	206	130	39	25	5·28	5·20
Hants . . .	17,221	13,793	2,775	2,749	6·21	5·02
Hereford . .	45,213	44,170	6,797	6,560	6·65	6·73
Kent . . .	258,431	271,347	34,058	34,266	7·59	7·92
Notts . . .	35	20	14	14	2·50	1·43
Salop . . .	646	577	117	112	5·52	5·15
Suffolk . . .	5	118	18	20	0·28	5·90
Surrey . . .	9,028	14,212	1,938	1,955	4·66	7·27
Sussex . . .	61,170	67,861	7,124	7,150	8·59	9·49
Worcester . .	21,239	24,411	3,369	3,280	6·30	7·44
Total . .	413,259	436,716	56,259	56,142	7·35	7·78

Royal Agricultural Society of England.

(*Established May* 9, 1838, *as the* English Agricultural Society, *and Incorporated by Royal Charter on March* 26, 1840.)

Patron.

(*Letter from Secretary of State, dated March* 6, 1840.)

HER MOST GRACIOUS MAJESTY THE QUEEN.

President for 1891—1892.

THE EARL OF FEVERSHAM.

Trustees.

Year when elected on Council	
1879	H.R.H. The Prince of Wales, K.G., *Marlborough House, Pall Mall.*
1838–40 1855	Acland, Rt. Hon. Sir Thomas Dyke, Bart., *Killerton, Exeter, Devonshire.*
1858	Bridport, Genl. Viscount, G.C.B., *Cricket St. Thomas, Chard, Somerset.*
1861	Cathcart, Earl, *Thornton-le-Street, Thirsk, Yorkshire.*
1861	Dent, John Dent, *Ribston Hall, Wetherby, Yorkshire.*
1871	Egerton of Tatton, Lord, *Tatton Park, Knutsford, Cheshire.*
1863	Kingscote, Col. Sir Nigel, K.C.B., *Kingscote, Wotton-under-Edge, Gloucestershire.*
1848	Lawes, Sir John Bennet, Bart., *Rothamsted, St. Albans, Herts.*
1854–59 1862	Macdonald, Sir Archibald K., Bart., *Woolmer Lodge, Liphook, Hants.*
1867	Ravensworth, Earl of, *Ravensworth Castle, Gateshead, Durham.*
1852–57 1866	Richmond and Gordon, Duke of, K.G., *Goodwood, Chichester, Sussex.*
1869	Ridley, Sir M. W., Bart., M.P., *Blagdon, Cramlington, Northumberland.*

Vice-Presidents.

1889	H.R.H. Prince Christian, K.G., *Cumberland Lodge, Windsor, Berkshire.*
1874	Chandos-Pole-Gell, H., *Hopton Hall, Wirksworth, Derbyshire.*
1872–74 1884	Chaplin, Rt. Hon. Henry, M.P., *Blankney Hall, Lincoln.*
1882	Emlyn, Viscount, *Golden Grove, Carmarthen, S. Wales.*
1876	Feversham, Earl of, *Duncombe Park, Helmsley, Yorkshire.*
1881	Gilbey, Walter, *Elsenham Hall, Essex.*
1872	Lathom, Earl of, *Lathom Hall, Ormskirk, Lancashire.*
1865	Lopes, Rt. Hon. Sir Massey, Bart., *Maristow, Roborough, Devon.*
1880	Moreton, Lord, *Sarsden House, Chipping Norton, Oxon.*
1874	Spencer, Earl, K.G., *Althorp, Northampton.*
1881	Thorold, Sir John H., Bart., *Syston Park, Grantham, Lincolnshire.*
1870	Whitehead, Charles, *Barming House, Maidstone, Kent.*

Other Members of Council.

Year when elected on Council	
1881	ALLENDER, G. MANDER, 7 *Albemarle Street, W.*
1862–66 1877	*ARKWRIGHT, J. HUNGERFORD, *Hampton Court, Leominster, Herefordshire.*
1880	ASHWORTH, ALFRED, *Tabley Grange, Knutsford, Cheshire.*
1890	*BEACH, JOSEPH, *The Hattons, Wolverhampton, Staffordshire.*
1889	*BEDFORD, Duke of, *Woburn Abbey, Bedfordshire.*
1871	BOWEN-JONES, J., *Ensdon House, Montford Bridge, Salop.*
1890	*BROUGHAM AND VAUX, Lord, *Brougham Hall, Penrith, Cumberland.*
1886	CAIRD, JAMES A., *Northbrook, Micheldever, Hants.*
1883	*CLAY, CHARLES, *Walton Grange, Wakefield, Yorkshire.*
1885	COVENTRY, Earl of, *Croome Court, Severn Stoke, Worcestershire.*
1887	CRUTCHLEY, PERCY E., *Sunninghill Lodge, Berkshire.*
1891	*CURTIS-HAYWARD, Lieut.-Col. J. F., *Quedgeley, Gloucester.*
1888	DARBY, ALFRED, *Little Ness, Shrewsbury, Salop.*
1886	DE LAUNE, C. DE L. FAUNCE, *Sharsted Court, Sittingbourne, Kent.*
1891	DUGDALE, J. MARSHALL, *Llwyn, Llanfyllin,* (viâ *Oswestry*) *Mont.*
1879	*FOSTER, S. P., *Killhow, Carlisle, Cumberland.*
1875	*FRANKISH, WILLIAM, *Limber, Ulceby, Lincolnshire.*
1879	GORRINGE, HUGH, *Kingston-by-Sea, Brighton, Sussex.*
1879	*GRENVILLE, R. NEVILLE, *Butleigh Court, Glastonbury, Somerset.*
1889	HAMOND, ANTHONY, *Westacre, Swaffham, Norfolk.*
1888	*HORNSBY, JAMES, *Stapleford Park, Melton Mowbray, Leicestershire.*
1876	HOWARD, CHARLES, *Biddenham, Bedfordshire.*
1886	MAINWARING, C. S., *Galltfaenan, Trefnant R.S.O., North Wales.*
1874	MARTIN, JOSEPH, *Highfield House, Littleport, Isle of Ely, Cambs.*
1884	MILLER, T. HORROCKS, *Singleton Park, Poulton-le-Fylde, Lancashire.*
1886	*MUNTZ, PHILIP ALBERT, M.P., *Dunsmore, Rugby, Warwickshire.*
1881	PARKER, Hon. CECIL T., *Eccleston, Chester.*
1886	PELL, ALBERT, *Hazelbeach, Northampton.*
1889	*PIDGEON, DANIEL, *Walsingham House, Piccadilly, W.*
1888	*PORTLAND, Duke of, *Welbeck Abbey, Worksop, Notts.*
1886	*RANSOME, J. E., *Holme Wood, Ipswich, Suffolk.*
1871	*RAWLENCE, JAMES, *Bulbridge, Wilton, Salisbury, Wilts.*
1889	ROWLANDSON, SAMUEL, *Newton Morrell, Darlington,* (*Yorkshire*).
1874	*SANDAY, GEORGE H., *Langdale Lodge, Clapham Park, Surrey.*
1886	SCARTH, W. T., *Staindrop House, Darlington, Durham.*
1886	SMITH, ALFRED J., *Rendlesham, Woodbridge, Suffolk.*
1889	*SMITH, HENRY, *The Grove, Cropwell Butler, near Nottingham.*
1889	*SPEARMAN, Sir J. L. E., Bart., *Llansannor Court, Cowbridge, Glam.*
1882	*STAFFORD, Marquis of, 23 *Berkeley Square, W.*
1891	STANYFORTH, E. WILFRID, *Kirk Hammerton Hall, York.*
1875	*STRATTON, RICHARD, *The Duffryn, Newport, Monmouthshire.*
1883	*SUTTON, MARTIN J., *Kidmore Grange, Caversham, Oxon.*
1889	TAYLOR, GARRETT, *Trowse House, Norwich.*
1890	TERRY, JOSEPH P., *Berry Field, Aylesbury, Buckinghamshire.*
1889	*TREMAYNE, JOHN, *Heligan, St. Austell, Cornwall.*
1882	*WARREN, REGINALD AUGUSTUS, *Preston Place, Worthing, Sussex.*
1889	*WHEELER, E. VINCENT V., *Newnham Court, Tenbury, Worcestershire.*
1889	WILSON, C. W., *Rigmaden Park, Kirkby Lonsdale, Westmoreland.*
1865	WILSON, Sir JACOB, *Chillingham Barns, Belford, Northumberland.*

* Members of Council who retire by rotation, but who may be re-elected.

STANDING COMMITTEES FOR 1892.

Finance Committee.

KINGSCOTE, Col. Sir NIGEL (Chairman).
BRIDPORT, General Viscount.
RIDLEY, Sir M. WHITE, Bt., M.P.
THOROLD, Sir J. H., Bart.
FRANKISH, W.
SANDAY, G. H.

House Committee.

CHAIRMAN of Finance Committee.
THE PRESIDENT.
BRIDPORT, General Viscount.
PARKER, Hon. C. T.
WILSON, Sir JACOB.
ALLENDER, G. M.
GILBEY, WALTER.

Journal Committee.

CATHCART, Earl (Chairman).
EMLYN, Viscount.
THOROLD, Sir J. H., Bart.
ASHWORTH, A.
CAIRD, J. A.
DE LAUNE, C. DE L. FAUNCE.
DENT, J. D.
FRANKISH, W.
PELL, A.
PIDGEON, D.
SUTTON, MARTIN J.
WHITEHEAD, CHARLES.

Chemical Committee.

EMLYN, Viscount (Chairman).
PARKER, Hon. C. T.
ACLAND, Sir T. D., Bt.
LAWES, Sir J. B., Bt.
MACDONALD, Sir A. K., Bt.
SPEARMAN, Sir J. L. E., Bt.
THOROLD, Sir J. H., Bt.
ARKWRIGHT, J. H.
BOWEN-JONES, J.
CAIRD, J. A.
DE LAUNE, C. DE L. FAUNCE.
DENT, J. D.
GRENVILLE, R. N.
HOWARD, C.
PELL, A.
STANYFORTH, E. W.
SUTTON, MARTIN J.
TERRY, J. P.
VOELCKER, Dr.
WARREN, R. A.
WHITEHEAD, CHAS.

Seeds and Plant Diseases Committee.

WHITEHEAD, CHAS. (Chairman).
THOROLD, Sir J. H., Bt.
ARKWRIGHT, J. H.
ASHWORTH, A.
BOWEN-JONES, J.
CAIRD, J. A.
CARRUTHERS, W.
DE LAUNE, C. DE L. FAUNCE.
FRANKISH, W.
HORNSBY, J.
MAINWARING, C. S.
ORMEROD, Miss E. A.
WHEELER, E. V. V.

Veterinary Committee.

THOROLD, Sir J. H., Bt. (Chairman).
BRIDPORT, General Viscount.
MORETON, Lord.
PARKER, Hon. C. T.
KINGSCOTE, Col. Sir NIGEL.
WILSON, Sir JACOB.
ALLENDER, G. M.
ASHWORTH, A.
AXE, Prof. J. WORTLEY.
BEACH, JOSEPH.
BROWN, Professor.
CHANDOS-POLE-GELL, H.
CLAY, C.
COPE, A. C.
CROOKSHANK, Prof.
CURTIS-HAYWARD, Lt.-Col.
DARBY, ALFRED
DENT, J. D.
FLEMING, Dr. GEORGE.
FOSTER, S. P.
HAMOND, A.
MASTER OF FARRIERS' COMPANY.
MILLER, T. H.
PRESIDENT OF ROYAL COLL. OF VETY. SURGEONS.
SIMONDS, Prof.
SMITH, A. J.
STANYFORTH, E. W.
TERRY, J. P.
WHEELER, E. V. V.
WILSON, C. W.

Stock-Prizes Committee.

SANDAY, G. H. (Chairman).
COVENTRY, Earl of.
BROUGHAM and VAUX, Lord.
MORETON, Lord.
PARKER, Hon. C. T.
SPEARMAN, Sir J. L. E., Bt.
WILSON, Sir JACOB.
ALLENDER, G. M.
ARKWRIGHT, J. H.
ASHWORTH, A.
BOWEN-JONES, J.
CHANDOS-POLE-GELL, H.
CRUTCHLEY, P. E.
DARBY, ALFRED.
FOSTER, S. P.
FRANKISH, W.
GILBEY, WALTER.
GORRINGE, H.
HOWARD, C.
MAINWARING, C. S.
MARTIN, JOSEPH.

Stock-Prizes Committee (continued.)

MILLER, T. H.
MUNTZ, P. A., M.P.
ROWLANDSON, S.
SIMONDS, Professor.
SMITH, A. J.
SMITH, HENRY.
STRATTON, R.
TAYLOR, GARRETT.
TERRY, J. P.
TREMAYNE, J.
WILSON, C. W.
The Stewards of Live Stock.

Implement Committee.

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BRIDPORT, Gen. Viscount.
MORETON, Lord.
PARKER, Hon. C. T.
THOROLD, Sir J. H., Bt.
WILSON, Sir JACOB.
ALLENDER, G. M.
ANDERSON, W.
BEACH, JOSEPH.
BOWEN-JONES, J.
CAIRD, J. A.
CLAY, C.
GRENVILLE, R. NEVILLE.
HORNSBY, J.
HOWARD, C.
MARTIN, JOSEPH.
PIDGEON, D.
RANSOME, J. E.
ROWLANDSON, S.
SANDAY, G. H.
SMITH, A. J.
SMITH, HENRY.
The Stewards of Implements.

General Warwick Committee.

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LEIGH, Lord.
BROOKE, Lord, M.P.
SEYMOUR, Lord Ernest.
FOSBERY, Major W. T. E.
MARGETTS, J. W.
MOORE, F. H.
NEWTON, T. H. G.
LEAMINGTON, Mayor of.
WARWICK, Mayor of.
WARWICK, Town Clerk of.

Show-Yard Works Committee.

WILSON, Sir JACOB (Chairman).
PARKER, Hon. C. T.
ALLENDER, G. M.
ASHWORTH, A.
CLAY, CHARLES.
FRANKISH, W.
HORNSBY, J.
HOWARD, C.
SANDAY, G. H.
STANYFORTH, E. W.

Committee of Selection.

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THOROLD, Sir J. H., Bt.
ASHWORTH, A.
CRUTCHLEY, P. E.
GRENVILLE, R. N.
TAYLOR, GARRETT.
TREMAYNE, J.

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CRAIGIE, Major.
DE LAUNE, C. DE L. FAUNCE.
DENT, J. D.
DUGDALE, J. M.
FOSTER, S. P.
MAINWARING, C. S.
PELL, A.
PIDGEON, D.
RANSOME, J. E.
SUTTON, M. J.
TREMAYNE, J.
VOELCKER, Dr.
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ARKWRIGHT, J. H.
ASHWORTH, A.
CURTIS-HAYWARD, Lt.-Col.
DARBY, ALFRED.
DUGDALE, J. M.
MAINWARING, C. S.
STANYFORTH, E. W.
TAYLOR, GARRETT.
VOELCKER, Dr.

*** The PRESIDENT is a Member *ex officio* of all Committees, and the TRUSTEES and VICE-PRESIDENTS are Members *ex officiis* of all Standing Committees except the Committee of Selection.

Chief Officials of the Society.

Secretary and Editor—ERNEST CLARKE, 12 *Hanover Square, W.*
Consulting Chemist—Dr. J. AUGUSTUS VOELCKER, 12 *Hanover Square, W.*
Consulting Botanist—W. CARRUTHERS, F.R.S., F.L.S., 44 *Central Hill, Norwood, S.E.*
Honorary Consulting Entomologist—Miss E. A. ORMEROD, F.R.Met.Soc., *Torrington House, Holywell Hill, St. Albans.*
Consulting Veterinary Surgeon—Professor JAMES BEART SIMONDS, *St. John's Villa, Ryde, Isle of Wight.*
Veterinary Inspectors—THE OFFICERS OF THE ROYAL VETERINARY COLLEGE.
Consulting Engineers—EASTON & ANDERSON, LIM., 3 *Whitehall Place, S.W.*
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GEOGRAPHICAL DISTRIBUTION OF MEMBERS OF THE COUNCIL AND OF GOVERNORS AND MEMBERS OF THE SOCIETY.

DISTRICTS	COUNTIES	NUMBER OF GOVERNORS AND MEMBERS	NUMBER OF MEMBERS OF COUNCIL	NAMES OF MEMBERS OF COUNCIL
A.	BEDFORDSHIRE	146	2	Duke of Bedford; C. Howard.
	BUCKINGHAMSHIRE	162	1	Jos. P. Terry.
	CAMBRIDGESHIRE	180	1	Joseph Martin.
	ESSEX	251	1	Walter Gilbey, V.P.
	HERTFORDSHIRE	192	1	Sir J. B. Lawes, T.
	HUNTINGDONSHIRE	70	—	
	LONDON	567	—	
	MIDDLESEX	92	2	G. M. Allender; Dan. Pidgeon.
	NORFOLK	315	3	H.R.H. the Prince of Wales, K.G., T.; Anthony Hamond; Garrett Taylor.
	OXFORDSHIRE	175	2	Lord Moreton, V.P.; M. J. Sutton.
	SUFFOLK	257	2	J. E. Ransome; A. J. Smith.
		—— 2407	— 15	
B.	CUMBERLAND	169	2	Lord Brougham and Vaux; S. P. Foster.
	DURHAM	174	2	Earl of Ravensworth, V.P.; W. T. Scarth.
	NORTHUMBERLAND	307	2	Sir M. White Ridley, T.; Sir Jacob Wilson.
	WESTMORELAND	78	1	C. W. Wilson.
		—— 728	— 7	
C.	DERBYSHIRE	200	1	H. Chandos-Pole-Gell, V.P.
	LEICESTERSHIRE	151	1	J. Hornsby.
	LINCOLNSHIRE	332	3	Sir J. H. Thorold, V.P.; Rt. Hon. H. Chaplin, V.P.; W. Frankish.
	NORTHAMPTONSHIRE	173	2	Earl Spencer, V.P.; A. Pell.
	NOTTINGHAMSHIRE	285	2	Duke of Portland; H. Smith.
	RUTLAND	39	—	
		—— 1,180	— 9	

DISTRIBUTION OF MEMBERS OF THE SOCIETY—*continued.*

Districts	Counties	Number of Governors and Members		Number of Members of Council		Names of Members of Council
D.	Berkshire	223		2		H.R.H. Prince Christian, K.G., V.P.; P. E. Crutchley.
	Cornwall	150		1		John Tremayne.
	Devonshire	200		2		Sir T. D. Acland, T.; Sir M. Lopes, V.P.
	Dorsetshire	86		—		
	Hampshire	254		2		Sir A. K. Macdonald, T.; J. A. Caird.
	Kent	407		2		C. Whitehead, V.P.; C. De L. F. De Laune.
	Somersetshire	143		2		Visct. Bridport, T.; R. Neville Grenville.
	Surrey	273		1		G. H. Sanday.
	Sussex	342		3		Duke of Richmond and Gordon, K.G., T.; H. Gorringe; R. A. Warren.
	Wiltshire	156	2,234	1	16	J. Rawlence.
E.	Yorkshire		923		6	Earl of Feversham, P.; Earl Cathcart, T.; J. D. Dent, T.; C. Clay; S. Rowlandson; E. W. Stanyforth.
F.	Gloucestershire	283		2		Col. Sir Nigel Kingscote, T.; Lt.-Col. J. F. Curtis-Hayward.
	Herefordshire	163		1		J. H. Arkwright.
	Monmouthshire	46		1		R. Stratton.
	Shropshire	378		3		J. Bowen-Jones; A. Darby; Marquis of Stafford.
	Staffordshire	286		1		Jos. Beach.
	Warwickshire	283		1		P. A. Muntz, M.P.
	Worcestershire	259		2		Earl of Coventry; E. V. V. Wheeler.
	South Wales	208	1,906	2	13	Viscount Emlyn, V.P.; Sir J. L. E. Spearman.
G.	Cheshire	357		3		Lord Egerton, T.; A. Ashworth; Hon. Cecil T. Parker.
	Lancashire	458		2		Earl of Lathom, V.P.; T. H. Miller.
	North Wales	209	1,024	2	7	J. M. Dugdale; C. S. Mainwaring.
Scotland		228				
Ireland		179				
Channel Islands		13				
Foreign Countries		175				
Honorary Members		21	616			
Grand Total			11,018		73	

GOVERNORS OF THE SOCIETY.

	Date of election as Member	Date of election as Governor
H.R.H. THE PRINCE OF WALES, K.G....Marlborough House, Pall Mall, S.W., and Sandringham	—	Feb. 3, 1864
†H.R.H. THE DUKE OF EDINBURGH, K.G....Clarence House, St. James's, S.W.	—	Aug. 6, 1884
†H.R.H. THE DUKE OF CAMBRIDGE, K.G....Gloucester House, Piccadilly, W.	—	Aug. 6, 1862
H.R.H. PRINCE CHRISTIAN OF SCHLESWIG-HOLSTEIN, K.G....Cumberland Lodge, Windsor	—	Aug. 4, 1875
*ACLAND, Rt. Hon. Sir T. Dyke, Bart...Killerton, Exeter	May 29, 1838	Mar. 3, 1875
†ALLCROFT, Herbert John...Stokesay Court, Onibury, Salop	—	Dec. 12, 1888
ALLCROFT, John D....108 Lancaster Gate, W.	April 2, 1862	June 29, 1870
†ALLENDER, G. Mander...7 Albemarle Street, W.	June 1, 1859	May 7, 1890
†AMHERST, W. A. Tyssen, M.P....Didlington Hall, Brandon	Feb. 2, 1859	May 7, 1890
†ARKWRIGHT, J. Hungerford...Hampton Court, Leominster	—	June 5, 1861
ASHBURTON, Lord...The Grange, Alresford, Hants	—	May 7, 1890
†ASHWORTH, Charles E....The Heath, Knutsford	July 5, 1865	July 29, 1891
*BAILLIE, W. Hunter...43 Norfolk Square, Hyde Park, W.	July 18, 1838	Mar. 5, 1890
†BATH, The Marquis of...Longleat, Warminster	—	July 6, 1853
BATHURST, Earl...Cirencester House, Gloucestershire	—	Nov. 3, 1886
*BATTEN, John...Yeovil, Somersetshire	July 16, 1839	Mar. 5, 1890
BECTIVE, Earl of, M.P....Underley Hall, Kirkby Lonsdale	—	July 1, 1868
†BEDFORD, Duke of...Woburn Abbey, Bedfordshire	June 3, 1879	July 29, 1891
†BENN, Thomas G....Reigny House, Newton Reigny, Penrith	Mar. 13, 1878	Aug. 2, 1882
BORTHWICK, Sir Algernon, Bart., M.P....Heath House, Hampstead Heath, N.W.	—	Dec. 12, 1888
BRADFORD, Earl of...Weston Park, Shifnal	Mar. 7, 1860	Mar. 3, 1875
BRASSEY, Henry Leonard C....Preston Hall, Aylesford	—	Feb. 3, 1892
BRIDPORT, Gen. Viscount, G.C.B....Cricket St. Thomas, Chard	Jan. 19, 1842	April 2, 1862
†BROOKS, Sir William Cunliffe, Bart....Barlow Hall, Chorlton-cum-Hardy, Manchester	—	Aug. 7, 1872
†BROWNE, Major Alexander H. T....Callaby Castle, Whittingham R.S.O., Northumberland	—	Mar. 6, 1872
BURTON, Lord...Rangemore, Burton-on-Trent	Nov. 7, 1888	June 25, 1890
CADOGAN, Earl, K.G...Culford Hall, Bury St. Edmunds	—	Dec. 11, 1889
†CALTHORPE, Lord...Elvetham, Winchfield	Aug. 6, 1862	June 3, 1874
†CATHCART, Earl...Thornton-le-Street, Thirsk	Feb. 6, 1856	April 3, 1867
†CAVENDISH, Victor C.W., M.P....Devonshire House, Piccadilly, W.	—	Mar. 2, 1892
CAWDOR, Earl of...Stackpole Court, Pembrokeshire	Nov. 17, 1841	Mar. 3, 1875
†CHANDOS-POLE-GELL, H....Hopton Hall, Wirksworth, Derbyshire	Nov. 6, 1861	June 23, 1891
CHAPLIN, Rt. Hon. Henry, M.P....Blankney Hall, Lincoln	—	Nov. 2, 1870
†CLIFDEN, Viscount... Holdenby House, Northampton	—	July 3, 1889
†CLINTON, Lord...Heanton Satchville, Beaford, N. Devon	April 3, 1867	April 2, 1890
CLITHEROW, Colonel Edward J. S....Hotham Hall, Brough, Yorkshire	—	Feb. 6, 1889
*CLUTTON, John...Buckland Court, Betchworth, Surrey	Dec. 15, 1838	Mar. 5, 1890
†COLMAN J. J., M.P....Carrow House, Norwich	June 1, 1870	Feb. 6, 1889

* Elected a Foundation Life Governor March 5, 1890. † Life Governor.

	Date of election as Member	Date of election as Governor
CORBETT, John, M.P....Impney, Droitwich	July 2, 1873	Feb. 4, 1891
CORNWALLIS, Fiennes S. W., M.P....Linton Park, Maidstone	—	July 2, 1884
COTES, Charles Cecil...Woodcote, Newport, Salop	—	Dec. 6, 1876
†COWPER, Earl, K.G....Panshanger, Hertford	—	April 7, 1875
CROOKSHANK, Prof. E. M....Saint Hill, East Grinstead	—	Nov. 6, 1889
DARNLEY, Earl of...Cobham Hall, Gravesend	—	May 5, 1852
D'AUMALE, H.R.H. The Duke...Wood Norton, Evesham	—	April 7, 1875
DARTMOUTH, Earl of...Patshull Hall, Wolverhampton	—	Dec. 9, 1891
DE LAUNE, C. de L. Faunce...Sharsted Court, Sittingbourne	—	Nov. 6, 1878
†DENT, John Dent...Ribston Hall, Wetherby	July 2, 1851	Feb. 3, 1875
†DERBY, Earl of, K.G....Knowsley, Prescot	July 31 1849	Mar. 5, 1890
DERWENT, Lord...Hackness Hall, Scarborough	—	April 7, 1869
†DEVONSHIRE, Duke of...Chatsworth, Chesterfield, Derbyshire	—	June 2, 1880
†DICKSON-POYNDER, Sir J., Bart....Hartham Park, Corsham, Wilts.	Nov. 2, 1887	April 2, 1890
†DUNMORE, Earl of...Dunmore, N.B.	—	Feb. 3, 1869
†DURHAM, Earl of...Lambton Castle, Durham	—	July 14, 1880
EGERTON OF TATTON, Lord...Tatton Park, Knutsford	Mar. 6, 1872	Nov. 7, 1883
†ELLESMERE, Earl of...Worsley Hall, Manchester	—	July 7, 1869
*ELLMAN, Robert H....61 North Street, Lewes	Feb. 13, 1839	Mar. 5, 1890
†EMLYN, Viscount...Golden Grove, Carmarthenshire	March 3, 1863	Mar. 2, 1892
*ESSEX, Earl of...Cassiobury Park, Watford	Dec. 11, 1839	Feb. 23, 1842
EVANS, John Carbery...Hatley Park, Gamlingay, Cambs.	—	Feb. 4, 1891
EVANS, Sir Thomas W., Bart. ..Allestree Hall, Derby	July 19, 1843	Feb. 4, 1857
EYRE, George Bramston...Welford Park, Newbury, Berks	—	Mar. 6, 1889
FEVERSHAM, Earl of...Duncombe Park, Helmsley	Mar. 5, 1862	Mar. 3, 1875
FIFE, Duke of, K.T....15 Portman Square, W.	—	Nov. 7, 1888
FITZWILLIAM, Earl, K.G....Wentworth Woodhouse, Rotherham	—	June 5, 1872
*FLETCHER, John Philip...Darby Lodge, Sunbury-on-Thames	Feb. 19, 1840	Mar. 5, 1890
†FORTESCUE, Earl...Castle Hill, South Molton	—	Nov. 6, 1861
FREAKE, Sir Thomas G., Bt....Warfleet, Dartmouth	—	July 30, 1890
†FREELAND, H. W...Chichester	—	May 5, 1852
†FREEMAN-MITFORD, A.B., C.B...Batsford Park, Moreton-in-the-Marsh, Gloucester	—	Nov. 3, 1886
†FYTCHE, J. Lewis...The Terrace, Freshwater, Isle of Wight	April 5, 1854	June 4, 1879
GILBEY, Walter....Elsenham Hall, Essex	Nov. 2, 1870	June 5, 1889
†GILL, Reginald B.E....Bickham, Roborough, S. Devon	July 2, 1884	Dec. 12, 1888
GILSTRAP, Sir W., Bart....Fornham Park, Bury St. Edmunds	May 7, 1862	April 2, 1890
GOOCH, Sir Alfred S., Bart...Benacre Hall, Wangford, Suffolk	—	July 13, 1882
GRAFTON, Duke of, K.G....Wakefield Lodge, Stoney Stratford	—	June 3, 1884
†GRANT, Sir G. Macpherson, Bt....Ballindalloch Castle, N.B.	April 1, 1863	April 2, 1890
*GREAVES, William...Bakewell	Dec. 4, 1839	Mar. 5, 1890
*†GREY, Earl, K.G....Howick, Lesbury, Northumberland	—	May 12, 1838
GRIFFITHS, John James...Highbury Grange, Highbury, N.	—	May 1, 1889
GWYNNE, John...Kenton Grange, The Hyde, N.W.	—	Mar. 5, 1879
†HAREWOOD, Earl of...Harewood House, Leeds	—	Mar. 6, 1861
HENRY, Mitchell...Kylemore Castle, Co. Galway	Nov. 7, 1877	Dec. 10, 1890
HERTFORD, Marquis of...Ragley Park, Alcester	Aug. 2, 1882	May 7, 1884
†HEYWOOD, Sir T. Percival, Bt...Doveleys (Uttoxeter), Derbysh.	—	May 14, 1845
†HOTHFIELD, Lord...Hothfield Place, Ashford, Kent	—	May 7, 1879

* Elected a Foundation Life Governor March 5, 1890. † Life Governor.

	Date of election as Member	Date of election as Governor
*Houblon, R. Archer...Bartlow, Cambridge	Jan. 10, 1840	Mar. 5, 1890
*†Hulse, Col. Sir Edward, Bt...Brêamore Ho., Fordingbridge	—	June 13, 1838
Joicey, E....Blenkinsopp Hall, Haltwhistle, Northumberland	—	Dec. 12, 1888
*Kemble, Thomas...Runwell Hall, Wickford, Essex	July 10, 1839	Mar. 5, 1890
†Kingscote, Col. Sir Nigel, K.C.B....Kingscote, Wotton-under-Edge, Gloucestershire	April 6, 1854	July 1, 1874
†Knight, Sir F. Winn., K.C.B...Wolverley House, Kidderminster	—	June 15, 1842
Kohlapur, H.H. The Maharajah of...Kohlapur, India	—	Feb. 6, 1889
Kynnersley, Thomas F....Leighton Hall, Ironbridge, Salop	Nov. 7, 1883	Nov. 4, 1891
†Lathom, Earl of...Lathom House, Ormskirk	April 7, 1869	Nov. 6, 1872
†Lawes, Sir J. B., Bart...Rothamsted, St. Albans	April 29, 1846	Dec. 11, 1878
†Leconfield, Lord...Petworth House, Sussex	—	June 5, 1872
Legh, William John...Lyme Park, Disley, Stockpo	—	Aug. 4, 1858
†Leicester, Earl of, K.G...Holkham Hall, Norfolk	—	Nov. 15, 1843
†Leigh, Lord...Stoneleigh Abbey, Kenilworth	—	Dec. 1, 1858
†Londesborough, Earl of...Londesborough Pk., Market Weighton	Nov. 5, 1862	April 2, 1890
†Londonderry, Marquis of, K.G....Seaham Hall, Seaham Harbour, co. Durham	—	June 3, 1885
†Lonsdale, Earl of...Lowther Castle, Penrith	—	July 4, 1883
†Lopes, Rt. Hon. Sir Massey, Bart...Maristow, Roborough, Devon	Mar. 15, 1848	May 7, 1884
*Lovelace, Earl of...East Horsley Towers, Leatherhead	—	June 26, 1838
Lucas, Sir Thomas, Bart...12a Kensington Palace Gardens, W.	—	Dec. 12, 1888
†Luttrell, Col. H. A. F., C.B....Badgworth Ct., Axbridge R. S. O.	July 7, 1869	Mar. 5, 1890
*Macclesfield, Earl of...Sherburn Castle, Tetsworth	Aug. 8, 1838	Mar. 5, 1890
†Macdonald, Sir A. K., Bart...Woolmer Lodge, Liphook	July 31, 1849	Nov. 1, 1871
†Manvers, Earl...Thoresby Park, Ollerton, Newark	—	July 2, 1873
†Maple, John...Bedford Lodge, Haverstock Hill, N.W.	Nov. 2, 1864	Mar. 5, 1890
†Marjoribanks, Rt. Hon. Edward, M.P....Ninewells, Chernside, N.B.	—	July 31, 1889
Middleton, Lord...Birdsall House, York	—	Mar. 3, 1875
Mildmay, Francis B., M.P...Flete, Ivy Bridge, Devon	—	Dec. 12, 1888
*Monck, J. Bligh...Coley Park, Reading	May 23, 1839	Mar. 5, 1890
†Moreton, Lord...Sarsden House, Chipping Norton, Oxon.	—	Mar. 3, 1875
†Morrison, Alfred...Fonthill House, Hindon, Wilts.	—	July 3, 1861
†Mount-Edgcumbe, Earl of...Mount-Edgcumbe, Plymouth	Nov. 6, 1861	Mar. 5, 1890
Muncaster, Lord...Muncaster Castle, Ravenglass, Cumberland	—	June 23, 1891
†Muntz, George F...Umberslade Park, Birmingham	Dec. 4, 1867	June 30, 1875
Neeld, Sir Algernon W., Bart...Grittleton, Chippenham	Nov. 7, 1888	Dec. 9, 1891
Norfolk, Duke of, K.G....Arundel Castle, Sussex		July 29, 1891
Normanton, Earl of...Somerley, Ringwood, Hants.	—	Mar. 3, 1875
*North, Rt. Hon. Col. J. Sidney...Wroxton Abbey, Banbury	May 8, 1839	Mar. 5, 1890
†Northbrook, Earl of...Stratton, Micheldever Station, Hants.	—	June 2, 1880
Paget, Lord Alexander...The Oaklands, arporley, Cheshire	July 6, 1881	July 3, 1889
†Peel, Edmund...Brynypys, Ruabon	Feb. 3, 1858	Mar. 5, 1890
*Pinney, Col. William...30 Berkeley Square, W.	Mar. 13, 1839	Mar. 5, 1890
†Portland, Duke of...3 Grosvenor Square, W.	—	June 2, 1880
†Portman, Viscount...Durweston, Blandford	Aug. 6, 1862	Mar. 5, 1890
Portsmouth, Earl of...Hurstbourne Park, Whitchurch, Hants.	—	Dec. 9, 1891
†Powis, Earl of...Powis Castle, Welshpool	April 6, 1887	June 23, 1891

* Elected a Foundation Life Governor March 5, 1890. † Life Governor.

	Date of election as Member	Date of election as Governor
Ravensworth, Earl of...Ravensworth Castle, Gateshead . .	Feb. 5, 1868	July 1, 1885
Revelstoke, Lord...Membland, Plymouth	—	June 4, 1890
*†Richmond & Gordon, Duke of, K.G...Goodwood, Chichester .	June 20, 1838	Dec. 2, 1868
†Ridley, Sir Matthew W., Bart., M.P....Blagdon, Cramlington .	Apr. 7, 1869	May 5, 1886
Ripon, Marquis of, K.G....Studley Royal, Ripon . . .	—	July 3, 1861
Rothschild, Lord...148 Piccadilly, W.	Nov. 7, 1888	June 4, 1890
*Russell, Lord C. J. F....Drakelow Lodge, Woburn . . .	May 26, 1838	Mar. 5, 1890
Rutland, Duke of, K.G....Belvoir Castle, Leicestershire . .	Dec. 12, 1888	Dec. 9, 1891
†St. Oswald, Lord...Appleby Hall, Brigg, Lincolnshire . .	April 5, 1848	June 23, 1891
†Salisbury, Marquis of, K.G...Hatfield House, Herts . . .	—	Feb. 6, 1889
†Salt, Sir W. H., Bart....Maplewell, Loughborough . . .	Feb. 5, 1868	Mar. 5, 1890
Savile, Lord, G.C.B...Rufford Abbey, Ollerton, Notts. . .	—	Mar. 27, 1889
*Saunders, T. B....The Priory, Bradford-on-Avon . . .	June 13, 1838	Mar. 5, 1890
†Schröder, Baron J. H. W....The Dell, Egham, Surrey . .	Nov. 3, 1869	April 2, 1890
†Sefton, Earl of...Croxteth, Liverpool	—	Dec. 8, 1869
*§Simonds, Prof. James Beart...St. John's Villa, Ryde, I. W. .	July 25, 1838	Mar. 5, 1890
*Simonds, W. Barrow...Abbotts Barton, Winchester . . .	June 19, 1839	Mar. 5, 1890
†Smith, Hon. W. F. D., M.P...3 Grosvenor Place, S.W. . .	—	Dec. 9, 1891
†Smyth, Sir J. H. Greville, Bart...Ashton Court, Som. (Bristol) .	—	July 3, 1878
Souberbielle, Edouard...78 Cromwell Road, S.W. . . .	—	Mar. 4, 1891
*Sparks, William...Crewkerne	June 6, 1838	Mar. 5, 1890
Spencer, Earl, K.G...Althorp Park, Northampton . . .	Dec. 5, 1860	Mar. 3, 1875
†Stapylton, Major H. M....Myton Hall, Helperby, Yorks. . .	July 11, 1865	May 7, 1890
*Stratton, J. Locke...Turweston House, Brackley . . .	May 13, 1839	Mar. 5, 1890
Sudeley, Lord...Toddington, Winchcomb	—	Nov. 5, 1879
Suffield, Lord.. Gunton Park, Norwich	July 1, 1868	Nov. 3, 1875
†Sutherland, Duke of, K.G...Stafford House, St. James', S.W..	—	July 1, 1868
†Sutton, John Manners...Kelham, Newark	—	May 8, 1844
†Sutton, Martin J...Kidmore Grange, Caversham, Oxon. . .	May 1, 1878	Feb. 1, 1882
†Swinburne, Sir John, Bart., M.P. Capheaton, Newcastle-on-Tyne	May 1, 1867	May 7, 1890
†Tanqueray, John S...Balmain, 5 Albany Road, St. Leonards .	Feb. 16, 1848	May 8, 1849
†Thorold, Sir John H., Bart....Syston Park, Grantham . .	Aug. 5, 1868	May 1, 1889
Tredegar, Lord...Tredegar Park, Newport, Mon. . . .	—	May 3, 1876
†Tweedmouth, Lord...Brook House, Park Lane, W. . . .	July 9, 1845	April 2, 1890
*Verney, Rt. Hon. Sir Harry, Bart....Claydon House, Winslow .	May 10, 1838	Mar. 5, 1890
†Wantage, Lord, V.C...Lockinge, Wantage	June 3, 1863	May 1, 1872
†Warwick, Earl of...Warwick Castle, Warwick	—	June 1, 1859
Westminster, Duke of, K.G...Eaton Hall, Chester . . .	July 3, 1860	June 5, 1872
†Whitehead, Charles...Barming House, Maidstone . . .	Apr. 1, 1857	Feb. 6, 1889
Willoughby De Broke, Lord...Kincton House, Warwick .	—	Dec. 10, 1890
Willoughby De Eresby, Lord...Normanton Park, Stamford .	Mar. 3, 1869	May 5, 1875
†Windsor, Lord...Hewel Grange, Bromsgrove	—	Nov. 6, 1878
*Winmarleigh, Lord...Winmarleigh, Garstang	—	May 12, 1838
*Wood, James...Ockley Manor, Keymer, Sussex . . .	Aug. 8, 1838	Mar. 5, 1890
†Yerburgh, Robert A., M.P...Billinge, Scarr, Blackburn . .	—	Nov. 7, 1888

* Elected a Foundation Life Governor March 5, 1890. † Life Governor. § Honorary Member.

HONORARY MEMBERS OF THE SOCIETY.

("*British Subjects or Foreigners who have rendered exceptional services to Agriculture or Allied Sciences,*" *and who have been elected under Bye-law* 8 *as Honorary Members, without payment of subscription.*)

	Date of election as Ordinary Member	Date of election as Honorary Member
ANDERSON, William, D.C.L., M.Inst.C.E....Lesney Ho., Erith, Kent	Aug. 2, 1871	Nov. 6, 1889
BROWN, Professor George T., C.B....3 St. James's Square, S.W.	Dec. 3, 1862	May 1, 1878
DANNFELT, Carl Juhlin...Consul-General of Sweden and Norway, 24 Great Winchester St., E.C.	—	Feb. 1, 1871
FLEMING, George, LL.D., C.B....Cathcart Lodge, Tyrwhitt Road, St. John's, S.E.	—	Mar. 13, 1878
GILBERT, Dr. J. H., F.R.S....Harpenden, St. Albans	—	July 4, 1883
HELLRIEGEL, Prof. Hermann...Bernburg, Anhalt, Germany	—	Dec. 9, 1891
HOFMAN, Dr....10 Dorothien Strasse, Berlin	—	Mar. 4, 1846
HOHENBRUCK, Baron Arthur von...I Niebelungengasse 8, Vienna	—	Nov. 5, 1890
LECOUTEUX, Edouard...26 Rue Jacob, Paris	—	April 7, 1869
PASSY, Louis...45 Rue de Clichy, Paris	—	June 23, 1891
PASTEUR, Louis...Membre de l'Institut, 45 Rue Ulm, Paris	—	Aug. 1, 1883
PLAYFAIR, Rt. Hon. Sir Lyon, K.C.B., M.P...68 Onslow Gdns., S.W.	—	July 6, 1842
PROSKOWETZ, Emanuel Ritter von, Senr....Kwassitz, Moravia	—	Nov. 5, 1890
RILEY, Prof. C. V., M.A., Ph.D....Department of Agriculture, Washington, U.S.A.	—	Dec. 7, 1887
SANDERSON, Dr. J. Burdon, F.R.S....Oxford	—	May 1, 1878
SCHLIEFFEN, Count...Schlieffenburg, bei Lalendorf, Mecklenburg, Germany	—	Dec. 12, 1883
SICKESZ VAN DE CLOESE, Dr. C. J....Heerengracht 17, The Hague, Holland	—	Dec. 9, 1891
SIMONDS, Prof. J. Beart...St. John's Villa, Ryde, Isle of Wight	July 25, 1838	Apr. 3, 1849
THIEL, Dr. H....Privy Councillor and Director of the Department of Agriculture, 17 Lutherstrasse, Berlin	—	Aug. 1, 1883
TISSERAND, Eugène...Directeur de l'Agriculture, Ministère de l'Agriculture, 17 Rue du Cirque, Paris	—	Aug. 1, 1883
VILMORIN, Henry L. de...17 Rue de Bellechasse, Paris	Aug. 2, 1879	June 4, 1890

SUMMARY OF MEMBERS ON THE REGISTER,

MARCH 31, 1892.

27 **Foundation Life Governors** (Members elected before the granting of the Charter on March 26, 1840).

67 **Governors** paying an annual subscription of 5*l*.

84 **Life Governors** who have compounded for their annual subscriptions.

6,990 **Members** paying an annual subscription of 1*l*.

28 **Members** who, having paid annual subscriptions for **50 Years**, have become Life Members.

3,729 **Life Members** who have compounded for their annual subscriptions.

72 **Life Members by Examination.**

21 **Honorary Members.**

11,018 **Total number of Governors and Members at March 31, 1892.**

Dr. BALANCE SHEET,

		£ s. d.	£ s. d.
To RESERVE FUND at December 31, 1890		28,962 5 0	
Interest on 30,000*l.* Consols for one year		804 7 8	
Life Compositions received during 1891		1,480 0 0	
		31,246 12 8	
Less: Contribution to Revenue from 3,941 Life Members at 14*s.*		2,758 14 0	
			28,487 18 8
To CAPITAL as per last account, represented by Books, Furniture, Country Meeting Plant, Machinery, &c. .		6,214 8 2	
Less: DEPRECIATION written off:			
Books and Furniture (10 per cent. off 2,732*l.* 17*s.* 6*d.*)	£273 5 9		
Country Meeting Plant (15 per cent. off 1,472*l.* 18*s.* 3*d.*)	220 18 3		
Machinery (10 per cent. off 1,207*l.*) . .	120 14 0		
		614 18 0	
		5,599 10 2	
Add: Balance at Credit of Ordinary Income and Expenditure Account, as per statement (*A*) . .		743 5 0	
Balance at Credit of Doncaster Show Account, as per statement (*B*)		103 17 8	
			6,446 12 10
			£34,934 11 6

ERNEST CLARKE, *Secretary.*
WELTON, JONES & CO., *Accountants.*

DECEMBER 31, 1891. Cr.

		£ s. d.	£ s. d.
By 30,000*l.* NEW CONSOLS ($2\frac{3}{4}$ per cent.) at cost . . .			29,033 9 4
Value on 31st December, 1891, at $95\frac{1}{4}$ = 28,575*l.* [Of this 30,000*l.* Stock, 105*l.* is held against Special Prizes.]			
By BOOKS and FURNITURE		2,459 11 9	
By COUNTRY MEETING PLANT (including 97*l.* 13*s.* 11*d.* purchased in 1891)		1,252 0 0	
By MACHINERY		1,086 6 0	4,797 17 9
By Sundry DEBTORS			247 10 0
By CASH IN HAND, December 31, 1891:			
Bankers		1,956 9 11	
Secretary and Surveyor		94 13 9	2,051 3 8
			36,130 0 9
Less: Sundry CREDITORS		494 2 0	
Receipts on account of 1892 . . .	1,192 12 6		
Less: Payments made on account of 1892	491 5 3	701 7 3	1,195 9 3
			£34,934 11 6

Memorandum:—The above Assets are exclusive of the amount recoverable in respect of arrears of Subscriptions to the 31st December, 1891, which amount to 421*l.*

Examined, audited, and found correct, this 29th day of February, 1892.

C. G. ROBERTS, } *Auditors on behalf of Society.*
A. H. JOHNSON, }

Income.

Corresponding figures for 1890		£ s. d.	£ s. d.
£	ANNUAL SUBSCRIPTIONS:—		
314	*Governors*: Subscriptions for 1891	336 0 0	
75	*Members*: Received in 1890, but belonging to 1891 .	75 0 0	
6,037	Subscriptions for 1891	6,597 16 0	
223	Subscriptions for previous years	398 0 0	
6,649			7,406 16 0
	LIFE COMPOSITIONS:—		
2,771	Contribution to Revenue (See Balance-Sheet)— 3,941 Members at 14*s*.		2,758 14 0
	RECEIPTS FROM PUBLICATIONS:—		
113	Ordinary Sales of Journal (less Publisher's charges) .	104 9 8	
390	Advertisements in Journal	425 14 6	
62 / 113	Sales in Office of Back Numbers of Journal	55 13 10	
66	Sales of Pamphlets and Lists of Members	34 4 6	
—	Sales of Insect Diagrams	42 9 10	
744			662 12 4
773	LABORATORY FEES	...	731 11 6
—	DEPOSITS OF COMPETITORS IN SENIOR EXAMINATION FORFEITED	...	4 0 0
210	RENTS FROM SUB-LETTING	...	210 0 0
82	INTEREST ON BANK BALANCES	...	47 7 9
11,229			£11,824 1 7

ERNEST CLARKE, *Secretary.*
WELTON, JONES & CO., *Accountants.*

Expenditure.

Corresponding figures for 1890 £		£	s.	d.	£	s.	d.
	GENERAL ADMINISTRATION:—						
2,105	Salaries of Secretarial Staff (including Temporary Assistance)	2,129	18	2			
190	Pensions to Officials	190	0	0			
45	Professional Charges (Solicitors, Auditors, &c.)	53	8	4			
817	House Rent, Taxes, House Expenses, and Repairs	811	9	11			
39	Binding and Purchase of Books	49	9	2			
387	Printing and Stationery	431	19	0			
214	Postage and Telegrams	197	11	6			
38	Carriage of Parcels, and Cabs	21	18	3			
94	Advertising and Miscellaneous Office Expenses	99	7	10			
					3,985	2	2
3,929							
	JOURNAL OF SOCIETY:—						
1,471	Printers' Bills for the four numbers of 1891	1,379	11	8			
129	Wood Engravings and Illustrations	112	19	9			
604	Literary Contributions and Assistance	596	16	2			
705	Postage, Packing, and Delivery	639	17	2			
55	Miscellaneous Journal Printing	130	13	2			
49	Miscellaneous Journal Expenses	47	10	11			
					2,907	8	10
3,014 458							
30 163	**PRINTING OF PAMPHLETS**				52	14	6
—	**DIAGRAMS OF INJURIOUS INSECTS, &C.**				321	5	0
	LABORATORY:—						
988	Salaries and Wages	1,193	9	0			
87	Apparatus and Chemicals	44	14	1			
77	Printing, Railway Travelling, and Sundry Expenses	48	5	11			
—	Law Costs *re* Snowsell	260	14	0			
					1,547	3	0
1,152	**OTHER SCIENTIFIC DEPARTMENTS:—**						
200 49	Consulting Botanist's Salary	200	0	0			
100	Consulting Entomologist's Salary	62	10	0			
500	Grant to Royal Veterinary College	500	0	0			
3	Medals for Proficiency in Cattle Pathology	2	14	0			
—	Net Expenses to Society of Potato Experiments	30	10	5			
					795	14	5
851							
	EDUCATION PRIZES AND SCHOLARSHIPS:—						
145	*Senior Examination*: Money Prizes, 55*l.*; Eight Life Memberships at 15*l.*=120*l.*	175	0	0			
61	Fees to Examiners	39	18	0			
200	*Junior Examination*: 10 Scholarships at 20*l.*	200	0	0			
16	Fees to Examiners	15	15	0			
12	Advertising Examinations	11	1	5			
11	Printing	12	13	8			
					454	8	1
445							
	GRANTS AND SPECIAL EXPENSES:—						
50	Further Contribution to Funds of Mansion House United Association on Railway Rates	...			200	0	0
50	Grant to Registration Scheme of Farriers	...			50	0	0
—	Grant to International Congress of Hygiene and Demography	...			50	0	0
309	Farm Prize Competition: Expenses of Judging	...			115	7	4
708	Stallion Premiums, and Expenses	...			601	13	3
11,160	Total Expenditure	...			£11,080	16	7
69	Balance carried to Balance Sheet	...			743	5	0
11,229					£11,824	1	7

Examined, audited, and found correct, this 29th day of February, 1892.

C. G. ROBERTS,
A. H. JOHNSON, } *Auditors on behalf of the Society.*

(*B*) STATEMENT OF RECEIPTS AND EXPEN-

Corresponding figures for 890.		£ s. d.	£ s. d.
	SUBSCRIPTION :—		
2,000	From Doncaster Local Committee		2,000 0 0
	FEES FOR ENTRY OF IMPLEMENTS :—		
2,860	Implement Exhibitors' Payments for Shedding	3,915 5 5	
134	Non-Members' Fees for Entry of Implements .	207 0 0	
			4,122 5 5
	FEES FOR ENTRY OF LIVE STOCK :—		
361	By Members :—1,743 Entries @ 5*s*.	435 15 0	
29	118 Post Entries @ 10*s*.	59 0 0	
248	By Non-members :—324 Entries @ 1*l*.	324 0 0	
16	24 Post Entries @ 2*l*.	48 0 0	
654			866 15 0
242	Fees for Horse Boxes and Stalls		511 10 0
	Fees for Shedding for Vehicles in Harness Classes		7 10 0
	FEES FOR ENTRIES OF POULTRY :—		
	By Members :—171 Entries @ 2*s*. 6*d*..	21 7 6	
162	By Non-members :—586 Entries @ 5*s*.	146 10 0	
	12 Post Entries @ 10*s*.	6 0 0	
	Entries of Table Poultry, 32 @ 1*s*.	1 12 0	
			175 9 6
	OTHER ENTRY FEES :—		
47	Non-Members' Fees for Entries of Produce	37 5 0	
9	Fees for Entry in Horse-shoeing Competition	6 10 0	
2	New Implement Fees forfeited	12 0 0	
			55 15 0
	CATALOGUE :—		
61	Extra Lines for particulars of Implement Exhibits	74 2 6	
6	Woodcuts for New Implements	9 10 0	
173	Advertisements in Combined Catalogue	241 15 2	
			325 7 8
	Sales of Implement Section of Catalogue (including bound copies).	50 1 0	
363	Sales of Combined Catalogue @ 1*s*.	710 5 0	
	,, ,, ,, (bound) @ 2*s*. 6*d*.	19 10 0	
	Catalogues sold after Show, &c.	25 3 11	
		804 19 11	
	Less Commission on Sales in Show-yard	63 0 0	
			741 19 11
	MISCELLANEOUS RECEIPTS :—		
114	Fines for non-exhibition of Live Stock	107 0 0	
8	Fines outstanding from previous Shows	16 10 0	
			123 10 0
385	Premiums for Supply of Refreshments.		515 0 0
50	Premium for Cloak Rooms and Lavatories		50 0 0
	Carried forward		9,495 2 6
7,270			

Corresponding figures for 1890.		£ s. d.	£ s. d.
	Cost of Erection of Showyard:—		
4,336	Timber	5,051 19 10	
383	Ironmongery	158 10 9	
60	Paints, Oil, Glass, Lead, &c.	62 5 7	
87	Bricks, Lime, Cement, Coal, &c.	94 8 2	
1,197	Canvas, Roofing Cloth, Felt, Baize, &c.	1,625 9 5	
408	Railway Charges, 480*l.* 17*s.* 10*d.*; Horse Hire, 163*l.* 18*s.* 6*d.*	644 16 4	
122	Stationery, Postage, and Telegrams	70 17 0	
	Insurance, 27*l.* 12*s.* 0*d.*; Hire of Furniture, 14*l.* 8*s.* 6*d.*	42 0 6	
1,841	Wages	2,266 19 11	
653	Superintendent of Works: Salary and Expenses	617 18 0	
9,087		10,635 5 6	
	Less:—		
2,607	Sale of Materials . . . £3,050 6 4		
1,328	Work for Exhibitors and Purveyors . . . 1,676 11 5		
		4,726 17 9	
5,152			5,908 7 9
	Expenses of Secretary's Department:—		
41	Expenses of Inspection Committee	31 1 3	
12	Secretary's Journeys to Doncaster and Expenses	9 2 6	
121	Expenses for Extra Clerkage	252 7 3	
26	Preparation of Catalogues	31 8 6	
			323 19 6
200			
	Printing:—		
331	Printing of Prize Sheets, Certificates, Admission Orders, Parchment Numbers, Circulars to Exhibitors, Prize Cards, Members' Tickets, and Miscellaneous	359 16 4	
14	Secretary's Local Printing	5 10 0	
42	Programmes for Members	38 15 3	
9	Plans of Showyard	6 15 6	
370	Printing of Stock and Implement Catalogues	662 11 9	
53	Binding of Catalogues	56 2 0	
18	Carriage of Catalogues to Showyard	17 0 1	
57	Printing Awards	98 1 5	
			1,245 1 4
896			
	Advertising, Bill Posting, and Placarding:—		
628	Advertising Closing of Entries, &c. in Newspapers	70 14 8	
	Advertising Show by Posters and Placards (including the Printing of Posters)	987 19 5	
			1,058 14 1
	Postage, Carriage, and Stationery:—		
110	General Postage, &c., 68*l.* 7*s.* 7*d.*; Postage of Tickets to Members, 39*l.* 1*s.* 3*d.*		107 8 10
4,485	**Amount of Prizes Awarded** (for details see page xviii)		4,950 10 0
	Cost of Forage for Live Stock:—		
600	Hay, Straw, 483*l.* 5*s.*; Green Food, 155*l.* 1*s.* 4*d.*; Expenses, 4*l.* 15*s.* 7*d.*		643 1 11
	Judges' Fees and Expenses:—		
142	Judges of Threshing Machines, 63*l.*; Ditto for Lodgings, 20*l.*; Judges of Separators, 52*l.*; Ditto for Lodgings, 20*l.*; Judges of Miscellaneous Implements, &c., 78*l.* 5*s.* 7*d.*; Ditto for Lodgings, 10*l.*	243 5 7	
644	Judges of Horses, 120*l.* 17*s.* 2*d.*; Cattle, 172*l.* 15*s.* 7*d.*; Sheep, 197*l.* 1*s.* 10*d.*; Pigs, 43*l.* 17*s.* 4*d.*; Poultry, 30*l.* 13*s.* 6*d.*; Cheese, 13*l.* 18*s.* 6*d.*; Butter and Butter-making, 25*l.* 8*s.*; Ditto for Lodgings, 10*l.*; Cider and Perry, 7*l.* 11*s.*; Jams and Preserved Fruits, 7*l.* 10*s.* 6*d.*; Horse-shoeing, 32*l.*; Ditto for Lodgings, 10*l.*	671 13 5	
20	Badges for Judges and other Officials	23 14 6	
41	Rosettes	30 5 0	
847			968 18 6
	Carried forward		15,206 1 11
12,919			

Corresponding figures for 1890.		£ s. d.	£ s. d.
7,270	Brought forward		9,495 2 6
	ADMISSIONS TO SHOWYARD:—		
22	Saturday, June 20, @ 2s. 6d.	41 5 0	
309	Monday, June 22, @ 5s.	667 15 0	
1,253	Tuesday, June 23, @ 2s. 6d.	1,541 11 9	
1,971	Wednesday, June 24, @ 2s. 6d.	2,318 0 0	
1,622	Thursday, June 25, @ 1s.	2,883 19 3	
702	Friday, June 26, @ 1s.	1,002 11 10	
			8,455 2 10
5,878			
138	Season Tickets, @ 10s. 6d.		82 8 6
	ENTRANCES TO HORSE RING:—		
34	Monday, June 22	56 6 0	
198	Tuesday, June 23	193 9 0	
128	Wednesday, June 24	243 10 0	
101	Thursday, June 25	138 14 0	
41	Friday, June 26	65 16 0	697 15 0
502			
	DAIRY:—		
33	Receipts at Stand at Dairy	50 11 0	
31	Sale of Produce at Dairy	69 3 11	
			119 14 11
64			
	PRIZES AWARDED:—		
	The total amount of PRIZES given was distributed as follows:—		
	Horses, 1,820*l.*; Cattle, 1,475*l.* 10*s.*	3,295 10 0	
	Sheep, 1,160*l.*; Pigs, 399*l.*	1,559 0 0	
	Poultry	324 10 0	
	Cheese, 148*l.*; Butter, 91*l.*	239 0 0	
	Cider and Perry, 30*l.*; Jams and Fruits, 16*l.*	46 0 0	
	Butter-making, 58*l.*; Horse-shoeing, 32*l.*	90 0 0	
	Implements	275 0 0	
	Silver Medals for New Implements	9 0 0	
	Contribution to Bee Department	40 0 0	
		5,878 0 0	
	Less:—		
	Prizes offered by Local Committee . . £845 0		
	" " Various Societies . . 70 10		
	" " Farriers' Company . . 12 0	927 10 0	
		4,950 10 0	
13,854			£18,850 3 9

ERNEST CLARKE, *Secretary.*
WELTON, JONES & CO., *Accountants.*

Corresponding figures for 1890.		£ s. d.	£ s. d.
12,919	Brought forward		15,206 1 11
	EXPENSES OF ADMINISTRATION:—		
350	*Stewards*:—Lodgings, 72*l.* 19*s.* 5*d.*; Housekeeping Expenses, 171*l.* 3*s.* 3*d.*; Personal and Railway Expenses, 109*l.* 16*s.* 5*d.*	353 19 1	
128	*Assistant Stewards*:—Honoraria, 48*l.* 15*s.*; Railway Expenses, 10*l.* 6*s.* 6*d.*; Lodgings, 40*l.*	99 1 6	
103	*Secretary and Official Staff*:—Houses, 50*l.* 15*s.*; Secretary's Expenses, 12*l.*; Maintenance of Clerks, 41*l.*; Travelling Expenses, 11*l.* 13*s.* 8*d.*	115 8 8	
100	*Finance Office*:—Superintendent of Turnstiles, 17*l.* 2*s.*; Money Changer, 10*l.* 10*s.*; Money Takers, 47*l.* 5*s.*; Bankers' Clerks, 15*l.* 16*s.*	90 13 0	
60	*Awards Office*:—Superintendent, 15*l.*; Clerks, 32*l.* 14*s.*; Award Boys, 12*l.* 5*s.* 6*d.*	59 19 6	
———			719 1 9
741	*General Management*:—		
34	Superintendent of Yard	36 12 0	
121	Foremen and Assistant Foremen	111 5 10	
278	Yardmen, Grooms, and Foddermen	427 13 0	
60	Door and Gate Keepers	43 18 10	
148	Carriage Hire, 73*l.* 4*s.*; Horse Hire, 84*l.* 17*s.* 9*d.*	158 1 9	
———			777 11 5
641			
86	*Veterinary Department*:—Veterinary Inspectors, 68*l.*; Ditto for Lodgings, 15*l.*; Veterinary Assistants, 25*l.* 15*s.* 4*d.*; Yardmen, 2*l.* 5*s.*	111 0 4	
445	*Engineering Department*:—Consulting Engineers and Assistants, 211*l.* 2*s.* 11*d.*; Ditto for Lodgings, 25*l.*; Carriage, 39*l.* 12*s.*; Repairs and Maintenance of Machinery, 95*l.* 2*s.* 9*d.*; Insurance, 7*l.* 17*s.* 6*d.*; Mechanic's Time at Trials of Cream Separators, 12*l.* 3*s.* 11*d.*	390 19 1	
519	*Police, &c.*:—Metropolitan Police, 520*l.* 12*s.* 10*d.*; Commissionaires, 21*l.* 9*s.* 11*d.*	542 2 9	
———			1,044 2 2
1,050			
202	*Dairy*:—Milk, 93*l.* 18*s.* 7*d.*; Ice, 15*l.* 3*s.* 2*d.*; Dairy Staff, 100*l.* 9*s.* 5*d.*; Salt, 1*l.* 8*s.*; Utensils, 27*l.* 7*s.* 5*d.*	238 6 7	
12	Expenses of Analysing Milk of Dairy Cows	9 18 11	
———			248 5 6
214			
26	*Poultry*:—Penning, Attendant and Food, 13*l.* 7*s.* 8*d.*: Dead Poultry, 12*l.* 16*s.*; Prize Cards, 8*l.* 6*s.* 8*d.*; Carriage of Exhibits, 7*l.* 17*s.* 2*d.*		42 7 6
9	*Horse Shoeing*:—Lecture on Farriery, 7*l.* 12*s.*; Nails, Coal, &c., 6*l.* 12*s.* 7*d.*; Gratuities, 3*l.* 5*s.*		17 9 7
	GENERAL SHOWYARD EXPENSES:—		
43	Hire of Furniture, 15*l.*; Hire of Chairs, 28*l.* 8*s.* 6*d.*	43 8 6	
39	Tan, 13*l.* 14*s.*; Telegraph, 7*l.* 14*s.* 3*d.*; Newspapers, 1*l.* 3*s.* 11*d.*	22 12 2	
93	Band of Yorkshire Dragoons	100 0 0	
18	St. John's Ambulance Association	12 12 0	
	Expenses of Royal Pavilion	56 5 0	
	Royal and Official Luncheons	51 11 2	
22	Miscellaneous Payments:—Secretary, 12*l.* 17*s.* 6*d.*; Surveyor, 38*l.* 8*s.* 6*d.*	51 6 0	
———			337 14 10
215	**TRIALS OF THRESHING MACHINES:—**		
	Wages to Workmen	87 8 8	
	Ironmongery, 16*l.* 15*s.* 2*d.*; Bricks, Lime, &c., 27*l.* 10*s.* 5*d.*; Coal, 13*l.* 14*s.* 11*d.*	58 0 6	
235	Tarpaulin, Rick Cloths, &c.	19 15 0	
	Railway Charges, 16*s.* 2*d.*; Police, 10*l.* 10*s.*	11 6 2	
	Expenses in Measuring up Fields, Stacking Corn, &c.	10 7 9	
			186 18 1
	Corn for Threshing Machines (net)		166 13 4
− 2,197	Credit Balance, carried to Balance Sheet		103 17 8
16,051			£18,850 3 9

Examined, audited, and found correct, this 16th day of November, 1891.

FRANCIS SHERBORN,
A. H. JOHNSON,
C. G. ROBERTS, } *Auditors on behalf of the Society.*

Table showing the Number of GOVERNORS and MEMBERS in each Year from the Establishment of the Society.

Year ending with Show of	President of the Year	Governors		Members			Total
		Life	Annual	Life	Annual	Honorary	
1839	3rd Earl Spencer	—	—	—	—	—	1,100
1840	5th Duke of Richmond	86	189	146	2,434	5	2,860
1841	Mr. Philip Pusey	91	219	231	4,047	7	4,595
1842	Mr. Henry Handley	101	211	328	5,194	15	5,849
1843	Earl of Hardwicke	94	209	429	6,155	15	6,902[1]
1844	3rd Earl Spencer	95	214	442	6,161	15	6,927
1845	5th Duke of Richmond	94	198	527	5,899	15	6,733
1846	Lord Portman	92	201	554	6,105	19	6,971
1847	Earl of Egmont	91	195	607	5,478	20	6,391
1848	Earl of Yarborough	93	186	648	5,387	21	6,335
1849	Earl of Chichester	89	178	582	4,643	20	5,512
1850	Marquis of Downshire	90	169	627	4,356	19	5,261
1851	5th Duke of Richmond	91	162	674	4,175	19	5,121
1852	Earl of Ducie	93	156	711	4,002	19	4,981
1853	Lord Ashburton	90	147	739	3,928	19	4,923
1854	Mr. Philip Pusey	88	146	771	4,152	20	5,177
1855	Mr. William Miles, M.P.	89	141	795	3,838	19	4,882
1856	Lord Portman	85	139	839	3,896	20	4,979
1857	Mr. E. Denison, M.P.	83	137	896	3,933	19	5,068
1858	Earl Berners	81	133	904	4,010	18	5,146
1859	Duke of Marlborough	78	130	927	4,008	18	5,161
1860	Lord Walsingham	72	119	927	4,047	18	5,183
1861	Earl of Powis	84	90	1,113	3,328	18	4,633
1862	H.R.H. Prince Consort Lord Portman	83	97	1,151	3,475	17	4,823
1863	Viscount Eversley	80	88	1,263	3,735	17	5,183
1864	Lord Feversham	78	45	1,343	4,013	17	5,496
1865	Sir E. C. Kerrison, Bt., M.P.	79	81	1,386	4,190	16	5,752
1866	Lord Tredegar	79	84	1,395	4,049	15	5,622
1867	Mr. H. S. Thompson	77	82	1,388	3,903	15	5,465
1868	6th Duke of Richmond	75	74	1,409	3,888	15	5,461
1869	H.R.H. Prince of Wales	75	73	1,417	3,864	17	5,446
1870	Duke of Devonshire	74	74	1,511	3,764	15	5,438
1871	Lord Vernon	72	74	1,589	3,896	17	5,648
1872	Sir W. W. Wynn, Bt., M.P.	71	73	1,655	3,953	14	5,766
1873	Earl Cathcart	74	62	1,832	3,936	12	5,916
1874	Mr. Edward Holland	76	58	1,944	3,756	12	5,846
1875	Viscount Bridport	79	79	2,058	3,918	11	6,145
1876	Lord Chesham	83	78	2,164	4,013	11	6,349
1877	Lord Skelmersdale	81	76	2,239	4,073	17	6,486
1878	Col. Kingscote, C.B., M.P.	81	72	2,328	4,130	26	6,637
1879	H.R.H. Prince of Wales	81	72	2,453	4,700	26	7,332
1880	9th Duke of Bedford	83	70	2,673	5,083	20	7,929
1881	Mr. William Wells	85	69	2,765	5,041	19	7,979
1882	Mr. John Dent Dent	82	71	2,849	5,059	19	8,080
1883	Duke of Richmond & Gordon	78	71	2,979	4,952	19	8,099
1884	Sir Brandreth Gibbs	72	72	3,203	5,408	21	8,776
1885	Sir M. Lopes, Bt., M.P.	71	69	3,356	5,619	20	9,135
1886	H.R.H. Prince of Wales	70	61	3,414	5,569	20	9,134
1887	Lord Egerton of Tatton	71	64	3,440	5,387	20	8,982
1888	Sir M. W. Ridley, Bt., M.P.	66	56	3,521	5,225	16	8,884
1889	Her Majesty The Queen	73	58	3,567	7,153	15	10,866
1890	Lord Moreton	122	58	3,846	6,941	17	10,984
1891	Earl of Ravensworth	117	60	3,811	6,921	19	10,928
1892 (March)	Earl of Feversham	111	67	3,829	6,990	21	11,018

[1] The figures for 1843 are taken from the December report, after the removal of the names of members who had discontinued their subscriptions; but it was reported in the previous May that 1,436 had been elected during the preceding twelve months, bringing the then nominal total to 7,285. In all other cases, from 1840 to 1891, the figures are from the reports of the Council to the anniversary meeting on May 22. It should, however, be observed that the totals were occasionally affected by the necessary revision of the list.

ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

Proceedings of the Council.

WEDNESDAY, FEBRUARY 3, 1892.

THE EARL OF FEVERSHAM (PRESIDENT) IN THE CHAIR.

Present:—

Trustees.—General Viscount Bridport, G.C.B., Earl Cathcart, Mr. John Dent Dent, Lord Egerton of Tatton, Colonel Sir Nigel Kingscote, K.C.B., Sir A. K. Macdonald, Bart., Duke of Richmond and Gordon, K.G., Sir M. W. Ridley, Bart., M.P.

Vice-Presidents.—H.R.H. Prince Christian, K.G., Mr. H. Chandos-Pole-Gell, Lord Moreton, Sir J. H. Thorold, Bart.

Other Members of Council.—Mr. G. M. Allender, Mr. Alfred Ashworth, Mr. Joseph Beach, Mr. J. Bowen-Jones, Mr. J. A. Caird, Mr. Charles Clay, Earl of Coventry, Mr. Percy E. Crutchley, Lieut.-Col. J. F. Curtis-Hayward, Mr. Alfred Darby, Mr. J. Marshall Dugdale, Mr. S. P. Foster, Mr. William Frankish, Mr. R. Neville Grenville, Mr. Anthony Hamond, Mr. James Hornsby, Mr. C. S. Mainwaring, Mr. Joseph Martin, Mr. T. H. Miller, Hon. Cecil T. Parker, Mr. Albert Pell, Mr. Dan. Pidgeon, Duke of Portland, Mr. J. E. Ransome, Mr. W. T. Scarth, Mr. A. J. Smith, Mr. Henry Smith, Sir Joseph Spearman, Bart., Mr. E. W. Stanyforth, Mr. R. Stratton, Mr. Martin J. Sutton, Mr. Garrett Taylor, Mr. C. W. Wilson.

Professor Brown, C.B.

Officers.—Mr. Ernest Clarke, Secretary and Editor; Dr. J. Augustus Voelcker, Consulting Chemist; Mr. Wilson Bennison, Surveyor.

The following members of the Warwick Local Committee were also present:—Lord E. J. Seymour, the Mayor of Warwick (Mr. J. W. Mann), the Mayor of Leamington (Mr. John D. Barbour), the Town Clerk of Warwick (Mr. Brabazon Campbell), and Mr. Frederick H. Moore (Secretary of the Local Committee).

Apologies for Non-attendance.

Apologies for non-attendance were received from Lord Brougham and Vaux, in consequence of absence abroad; from Sir Jacob Wilson, Mr. Walter Gilbey, Mr. Sanday, Professor Simonds, Mr. Tremayne, Mr. Warren, and Mr. Whitehead, in consequence of ill-health; from the Earl of Lathom and Mr. Arkwright, in consequence of other engagements; and from Lord Leigh and Lord Brooke, M.P. (Members of the Local Committee).

Address of Condolence to Her Majesty the Queen.

Immediately after the confirmation of the minutes of the last meeting, held on December 9, 1891, the PRESIDENT rose and said:—Your Royal Highness, my Lords, and gentlemen, I rise at the earliest opportunity to perform one of the saddest duties which ever devolved upon a President of the Royal Agricultural Society, to propose a vote of condolence with Her Most Gracious Majesty the Queen in the great and irreparable loss which Her Majesty and the Royal Family have sustained in the death of His Royal Highness the Duke of Clarence. In ordinary circumstances the death

of a Prince in direct succession to the Throne would be an event which would afflict the Crown, and give great concern to the country; but to lose a Prince who was so precious to Her Majesty and to her family, and so beloved by all who had the honour of knowing him, is a calamity—perhaps one of the greatest calamities which have ever befallen Her Majesty and the nation at large. His Royal Highness the Duke of Clarence inherited many of those qualities which distinguish his illustrious parents. No one has ever been brought in contact with His Royal Highness without being struck with his kindness of heart, his courtesy, his consideration for others, and his readiness and anxiety to discharge those duties, philanthropic, social, or otherwise, which devolve upon one in his high station. A good and high-minded Prince has passed away, and from every quarter of this vast Empire have come evidences of the sense of the great loss which the nation has sustained. Her Majesty the Queen has ever taken a deep interest in the operations and work of this Society, and I am sure every member of the Council, and, beyond the Council, every member of the Society and of the great agricultural community at large, will be anxious to express their heartfelt sorrow and deep sympathy with Her Majesty in the great trial with which it has pleased Providence to visit her. It is our fervent prayer that the touching words of Her Majesty in the letter which she has addressed to her people may be fully realised, and that God may give her strength to bear this trial and health to rule for years to come over a devoted, a loyal, and an attached people.

I beg now to move the following humble Address of condolence to Her Majesty the Queen:—

TO THE QUEEN'S MOST EXCELLENT MAJESTY.

May it please Your Majesty:

We, the President and Council representing the general body of Governors and Members of the Royal Agricultural Society of England, beg leave humbly to approach your Majesty with the assurance of our deep and heartfelt sorrow at the untimely death of His Royal Highness the Duke of Clarence and Avondale, and of our earnest and respectful sympathy with your Majesty in your affliction.

The high promise of His Royal Highness's youth, the many amiable qualities which endeared him to all with whom he came in contact, and the happiness which appeared to be in store for him in the immediate future, have all combined to intensify the national sense of the loss which your Majesty and your people have sustained by his sudden and melancholy decease.

We are always mindful of the gracious interest ever taken by your Majesty and the other members of your Majesty's family in every subject connected with the agriculture of your realm, and we desire to assure your Majesty that no class of your subjects is more devotedly attached to your throne and person than the agriculturists of England.

In their name and on their behalf, we humbly beg to express to your Majesty their deep sense of the heavy affliction which has befallen your Royal House and the nation at large by the death of His Royal Highness; and we earnestly pray that the Almighty may vouchsafe to your Majesty health and strength to guide for many years to come the destinies of the Empire over which your beneficent rule extends.

L.S.

Given under the Common Seal of the Royal Agricultural Society of England, this third day of February, 1892,

FEVERSHAM, President.
EGERTON OF TATTON, Trustee.
ERNEST CLARKE, Secretary.

Lord Egerton of Tatton, in seconding the motion, said: There are many members of this Council who could in more eloquent language than myself have seconded the Address of Condolence, but none could do so with greater sincerity and feeling. I had the pleasure, during the year of my presidency, of announcing to the Members of the Society at the General Meeting held in the Newcastle Showyard that the Prince whose untimely loss we now deplore had expressed his desire to be enrolled as one of our Members; and it is now my melancholy satisfaction to second the Address which has just been moved. I am sure His Royal Highness's love of a country life would, if he had lived, have made him an eminent and active agriculturist. As all who had observed his public and private life must have seen, he had those qualities of thoughtfulness and eminent good sense, joined with that peculiar charm of manner and courtesy, which the President has well said are inherited from his parents, and which combine to make a popular constitutional sovereign. But the hand of Providence has willed it otherwise; and we can only humbly and respectfully offer our sincere condolences to Her Majesty the Queen and the other members of the Royal Family on the loss they have sustained. From Her Majesty the Society has received such signal favours, that everyone present must feel it is specially our duty as agriculturists to express our humble and loyal sympathy with Her Majesty in her great affliction. In doing so, we are expressing, not only the feelings of those in this room, but of the great body of those engaged in what is the largest and most important industry in this Kingdom.

Address of Condolence to Their Royal Highnesses the Prince and Princess of Wales.

The Duke of Richmond and Gordon, in moving the Address, said: As a Member of this Society since its very beginning in 1838, I hope I may not be considered presumptuous in rising to move an Address of Condolence with Their Royal Highnesses the Prince and Princess of Wales at the loss which they have sustained. I have had many opportunities of observing the deep interest which the Prince of Wales has taken in the welfare of our Society; and it is not necessary for me to point out that His Royal Highness has identified himself with the agricultural interest on all occasions. The Princess has accompanied His Royal Highness to many of our Shows, and I am sure every Member will desire that the very first opportunity should be taken of presenting an Address of Condolence with Their Royal Highnesses in their sad affliction. I have had the honour for many years of the friendship of Their Royal Highnesses, and I can speak of the very devoted affection which they bear to their children. There are no parents in the United Kingdom who are fonder of their family than the Prince and Princess of Wales. They had scarcely been relieved from the anxiety attendant upon the illness of Prince George when they were crushed down by the death of their eldest son, after only a week's illness. The Duke of Clarence, as has been truly said, was one of the most popular men in the country. He began life in the Navy, where he was popular; in the Army he was equally popular; in the University those who had known him there tell me that there was no more popular man than His Royal Highness; and in society I do not think he had a single enemy. With every expectation of happiness; with marriage in prospect, at no distant date, to one of the most popular and amiable Princesses of the Royal Family—a marriage which we all know was entirely with the approval and the sanction and, I may say, with the delight of Their Royal Highnesses his parents; with every hope before him of a career as illustrious as that of his father and of our Gracious Sovereign the Queen—he has been suddenly snatched from us by the hand of Death. The subject is one too sad for us to dwell upon, and if I were to speak for a much longer time I could not use language that would better show Their Royal Highnesses how we sympathise with them in their deep sorrow than the words of the Address which I now beg to move:—

TO THEIR ROYAL HIGHNESSES THE PRINCE AND PRINCESS OF WALES.

May it please Your Royal Highnesses:

We, the President and Council representing the general body of Governors and Members of the Royal Agricultural Society of England, desire to express to your Royal Highnesses our deep and heartfelt sorrow at the grievous calamity which has deprived your Royal Highnesses of your dearly loved son, and the nation of a Prince whose high personal qualities had already endeared him to the hearts of the people of this Empire.

The great promise of the youth of His Royal Highness the Duke of Clarence, his diligent and conscientious devotion to duty, and the vista of happiness which appeared to be opening for him in the immediate future, have combined to unite the whole nation with your Royal Highnesses in a common sorrow, and to intensify the universal grief at his sudden and melancholy decease.

The Royal Agricultural Society of England has received so many marks of your Royal Highnesses' favour and interest in its work that the Members of the Society feel as a personal loss the death of His Royal Highness, and they desire humbly to be allowed to approach your Royal Highnesses with the assurance of their earnest and respectful sympathy in your sad affliction.

L.S.

Given under the Common Seal of the Royal Agricultural Society of England, this third day of February, 1892,

FEVERSHAM, President.
RICHMOND & GORDON, Trustee.
ERNEST CLARKE, Secretary.

Mr. BOWEN-JONES, in seconding the Address, said: It is a melancholy satisfaction to me, as the senior ordinary Member of Council present, to second the resolution which has been so ably and pathetically proposed by the noble Duke. As a large association, representing the agriculturists of England, we, in common with all Her Majesty's subjects throughout the vast dominions of the Crown, desire to express our sincere and respectful sympathy with His Royal Highness the Prince of Wales, Her Royal Highness the Princess of Wales, and the other members of their family on the sad calamity which has fallen upon their House by the death of the Duke of Clarence and Avondale. Although this loss is irretrievable, let us hope that the spontaneous outburst of sympathetic respect which has been shown throughout the length and breadth of the land, and the heartfelt sympathy that pervades the mind of each and every one of the members of the Council of this Society, in the affairs of which the Prince takes such a deep personal interest, may to some extent prove a solace and consolation to His Royal Highness and the Princess in this their hour of trial and tribulation.

The adoption of both Addresses was then put by the PRESIDENT, and carried unanimously in silence, all the Members standing.

Sir NIGEL KINGSCOTE then moved, Earl CATHCART seconded, and it was unanimously resolved:

That the Addresses of Condolence be engrossed upon vellum, that the Common Seal of the Society be affixed thereto, and that each Address be signed by the President, a Trustee, and the Secretary.

The late Duke of Devonshire.

The PRESIDENT then said that it was his painful duty to announce the death of one who was a very highly valued and esteemed member of their Council, the late Duke of Devonshire. The late Duke was endowed with great wealth and with large estates, but he was endowed with something more valuable still. He was endowed with that knowledge,

that patriotism, and that wisdom which knew how to turn those great properties to good account, and how to make them a source of benefit to the people with whom he came in contact. Amongst other interests which he supported was, as he need not say, the great agricultural interest. He was a very successful breeder of Shorthorns, and at Holker possessed one of the most valuable herds in the country. He would not say more on that occasion, because a very appropriate obituary had been written of his Grace in the last quarterly Journal of the Society; but he was sure that every Member of the Council deeply regretted the loss of one so eminent and patriotic as was the late Duke of Devonshire.

Election of New Governor and Members.

The election of the following Governor and 104 Members was then proceeded with:—

Governor.

Brassey, H. L. C...Preston Hall, Aylesford.

Members.

Addison, E...Navenby, Lincoln.
Ainscough, R...Burscough Mills, Lathom.
Ainsworth, D...The Flosh, Cleator, Carnforth.
[1] Arnold, Miss May..Whitethorns, Acton, W.
Arthur, T...Gloswicks, Worksop.
Baldwin, A...Wilden House, Stourport.
Bellamy, F. Wm...Middlemore Ho., Ramsey.
Berens, R. B...Kevington, St. Mary Cray.
Bettington, J. B., jun...64, St. Mark's Rd., W.
Bilton, M...Newington Ironworks, Hull.
Birch, G. P...Forest Row.
Bocock, Wm...Gazeley, Newmarket.
Boutflour, R...Whelly Hill, Castle Eden.
Brigg, L...Guard House, Keighley.
Brough, H. W...Seaton, New Seaham.
Burke, U. R...Broxhead Warren, Alton.
Chatterjee, K. C...2, Madhn Sudon, Chatterjee's Lane, Tallah, Calcutta.
Cock, C. H...Mathon Lodge, West Malvern.
Coles, R. W...Small Heath, Birmingham.
Colman, J...Gatton Park, Surrey.
Coode, A...Trevarthian, St. Austell.
[1] Cook, F. S... 163, Brushfield Pl., Edinburgh.
Cook, R...Padworth, Reading.
Corbet, Sir W. O., Bt...Acton Reynald, Salop.
Coryton, W...Pentillie Castle, St. Mellion.
Counsellor, W. P...Whalley, Lancs.
Crosbie, J...New Farm, Tetworth.
Crosbie, J...Holme (Hunts.).
Curtis, T. D...Winslow, Bucks.
Davies, E. J...Old Milverton, Warwick.
Davy, R...Elsham, Briggs.
Dawson, E. H...Aldeliffe Hall, Lancaster.
De Rutzen, Baron..Slebech, Park, Haverfordwest.
Dugdale, J. B...Wroxall Abbey, Warwick.
Eden, T...Park Ho., Over, Knutsford.
Edwards, F. A...Slynes Oak, Chelsham Surrey.
Elliott, T. H...4, Whitehall Place, S.W.
Firman, C. O...Gateforth, Selby, Yorks.
Firth, J. L...Hope, *viâ* Sheffield.
Fletcher, L. H...Brigham Hill, *viâ* Carlisle.
Goodman, J. F...Flecknoe, Rugby.
Greenall, G., jun...Walton Hall, Warrington.
Gryles, W. M...Falmouth.
Hanson, J...Belle Vue, Wakefield.
Harris, C...57 and 58, Chancery Lane, W.C.
Henton, J...Upper Gatton, Redhill.
Horniblow, H...Radbroke, Stratford-on-Avon.
Howell, F. B...Ethy, Lothwithiel.
Hulme, H...Baginton, Coventry.
Hutchinson, W...Marston, Grantham.
Ingoldby, F. J...Hallowgate, Louth.
Inskip, A...Hardwicke Farm, Shefford, Beds.
Isler, C...Bear Lane, Southwark, S.E.
Lambert, C...Snettisham, Norfolk.
Lawson, J. G...Elm Bank, York.
Leadbitter, E...The Spital, Hexham.
Leather, G. F. T...Middleton Hall, Belford.
Lewes, Col. W...Llysnewydd, Carmarthens.
Litt, G...High Pow, Wigton.
Lythall, W. H...113, Gough Rd., Edgbaston.
Macqueen, G...Coed-y-Dinas, Welshpool, Mont.
Mitchell, C. W...195, Queen's Gate, S.W.
Mole, R. B...Callington.
Monson, H. J...Dunmore, Scarborough.
Morgan, N...Sigginstone, Cowbridge, Glam.
Morrice, F. L. H...Redenham Pk., Andover.
Musgrave, Sir R. G., Bt...Edenhall, Cumberland.
Myatt, J...Calder Fields, Walsall.
Nunn, J...Rushbrooke, Bury St. Edmunds.
Ockey, J. T...Evesbatch, Worcester.
Palmer, H...Snitterfield, Stratford-on-Avon.
Parker, H...Parkfield, Potter's Bar.
Parker, H. J...Tarrington, Ledbury.
Parsons, W. H...Wolston, Coventry.
Phillips, J. P...Peuerley Farm, Beaulieu, Hants.
Puxley, J. J...Leamington Spa.
Rand, J...Boufre Farm, Beaulieu, Hants.
Ranson, A...16, High Street, Bedford.
Reade, F. O'S. B...83, Warwick Road, S.W.
Richards, W. T...Gwealavellan, Hayle.
Richardson, R. N...No. Seaton, Newbiggin-by-the-Sea.
Robinson, R...Sedgefield, Ferryhill.
Rows, R. G...Helston.
Royles, T. H...Dordon Hall, Tamworth.
Sherwood, C. S...Theberton, Saxmundham.
Sherwood, R. H...Bawdsey, Woodbridge.
Siddle, W. E...Penrith, Cumberland.
Staples, Sir N. A., Bt...Lissau, co. Tyrone.
Stapley, W. S...Alresford, Hants.
Starky, G. B.. Brackenfield, Amberley, N.Z.
Stopford, Capt. Hon. E. B...The Grange, Ellesmere.
Symm, J...Newton, Stocksfield-on-Tyne.
Tayler, J. W...Cold Aston, Cheltenham.
Thomas, A...Bronwydd, Cardiff.
Threlfall, E.. Halsall, Ormskirk.
Tichborne, Sir H. A. D., Bt...Tichborne Pk., Alresford.
Till, W...Caerwent, Chepstow, Mon.
Tremayne, Lt.-Col., A...Carclew, Perranarworthal, Cornwall.
Turner, P...7, Lower Brook Street, Ipswich.
Warne, J...Trelewack, St. Ewe, St. Austell.
Wilkinson, W...Moss Bank Farm, Toft, Knutsford.

[1] Reinstated under Bye-Law 12.

WILLIAMS, A. E...Alcester Rectory.
WOODROOFE, R. H...Ballysaggartmore, Lismore, co. Waterford.
YOUNG, J. A...12, Victoria St., S.W.

Country Meeting of 1893.

The SECRETARY laid upon the table the following petitions and memorials received by the Society from local public bodies in support of the invitations received from Chester and Manchester respectively:—

In support of Chester.

From the Municipal Authorities of Abergele and Pensarn, Beaumaris, Birkenhead, Crewe, Denbigh, Dolgelly, Holyhead, Llandudno, Llanfyllin, Llangefni, Menai Bridge, Nantwich, Neston and Parkgate, Newtown and Llanllwchaiarn, Northwich, Towyn, Winsford, Wrexham and Ynyscynhaiarn; the County Councils of Anglesey, Chester, Carnarvon, Denbigh, Flint, and Merioneth; the Cheshire Dairy Farmers' Association; and the Agricultural Education Committee of the University College of North Wales.

In support of Manchester.

From the Municipal Authorities of Accrington, Ashton-under-Lyne, Bacup, Blackburn, Blackpool, Bolton, Bootle, Bury, Chorley, Clitheroe, Darwen, Heywood, Liverpool (letter from the Mayor), Lytham, Middleton, Nelson, Oldham, Preston, Rochdale, St. Helens, Salford, Southport, Stockport, Warrington, and Wigan; the County Council of Lancaster; the Chambers of Commerce of Barrow-in-Furness, Blackburn, Manchester, Oldham, and Rochdale; the Local Agricultural Societies of Edgeworth and District, Leigh (Lancs.), Middleton North Lonsdale, Padiham, Rossendale, and Worsley and District.

Sir NIGEL KINGSCOTE read the report of the Committee of Inspection appointed by the Council at their last meeting to examine and report upon the sites and other accommodation offered by the cities of Chester and Manchester for the Country Meeting of 1893. The Committee, after describing the various sites examined by them, said that the circumstances of the two invitations were so different that they did not feel in a position to make a definite recommendation for the acceptance of either Chester or Manchester, and they must leave the decision, therefore, in the hands of the full Council.

The Hon. CECIL T. PARKER asked which of the sites inspected by the Committee was considered the more eligible—that at Hoole or the one at Trafford Park?

The PRESIDENT thought he might say in answer to that question, as he was one of the Committee of Inspection, that there was little doubt that the site at Hoole was the best of the four inspected by the Committee.

Invitation from Chester.

The Hon. CECIL T. PARKER then introduced a deputation from Chester, consisting of the Duke of Westminster, K.G., Lord Tollemache, Sir Watkin Williams Wynn, Bart., Mr. R. A. Yerburgh, M.P. for Chester, the Mayor of Chester, the Town Clerk of Chester, Mr. D. A. Gilchrist (of the North Wales University College at Bangor) and Mr. G. A. Dickson (Local Secretary).

The Duke of WESTMINSTER said he appeared as Chairman of the Committee which had been formed for the purpose of inducing the Royal Agricultural Society to come to Chester. Chester was the centre of a strictly agricultural district, comprising the whole of Cheshire, which was purely agricultural, and the six counties of North Wales. Though in two or three of these counties mineral industries were carried on, still the main industry was that of agriculture. Very considerable attention had been given for some years to the development of agricultural training in the county of Chester, and remarkable steps had been taken under the auspices of the county, in connection with the North Wales University College at Bangor. They had done a great deal in the direction of agricultural education, and would do a great deal more in the future; and, as they were helping themselves, they looked for the assistance of the Royal Agricultural Society. It was thirty-four years since the first Meeting of the "Royal" was held at Chester; and it would be in their recollection that that was the first Meeting from which a profit accrued to the funds of the Society, owing to the numbers who attended from surrounding districts, and especially from the great centres of population in Lancashire. Although, of course, Chester was a very small city compared with the enormous manufacturing towns in Lancashire, it was hardly necessary to remind the Society that it was a very important centre as regards its railways. There were railways from the

great towns in every part of the kingdom, and the railways running through North Wales gave great facilities of access to the Show from those parts of the district. Ample accommodation was afforded by the railway station at Chester, which was on a very large scale, both for goods and passengers. It was now being enlarged, and would be finished long before the time that it would be needed for the Show. The site at Hoole was a very extensive one, and a very important element in connection with it was that the soil was dry and gravelly. The Society had been three times into Lancashire since the Meeting at Chester, but he thought that on the whole their case was strongest, because the Society had never held a Meeting in North Wales. Chester was situated so conveniently that it must be considered as the capital of North Wales, and it was extremely convenient for the agricultural population of that district. The Society existed for the purpose of encouraging agriculture, and not so much in order to hold a Show for the sake of obtaining money; but even supposing it were so, he believed that Chester would be able to hold its own; and if it were decided to go there, they might argue from previous Shows that the result would not be disappointing. They had a very strong and influential Committee in Chester, and there would be no difficulty with regard to the financial arrangements. He ventured to promise to the Society that nothing should be wanting on their part to give a cordial welcome, and to make the Show a success, if not as great a success as some of the Shows, at least as great as could be reasonably expected.

The Mayor of CHESTER, as representing the Corporation, said that if the Council should decide to come to Chester, they would feel it as a very great honour, and all that was possible would be done to receive the Society in a proper manner. He was old enough to remember the Chester Show of 1858, which was a great success—in fact, the greatest success which the Society had had up to that date. On behalf of the city he could assure them that every possible attention would be given to securing the success of the Show in 1895 if, as he hoped, the Council decided to come to Chester.

Mr. DOUGLAS A. GILCHRIST, representing the University College of North Wales, referred to the support which he believed would be forthcoming from the agriculturists of North Wales, in the event of the Society deciding to hold its Show at Chester, and to the educational value which such a visit would have, and said that the Society by visiting Chester would give a powerful stimulus to the spread of the system of technical instruction in agriculture which had been developed in North Wales.

Sir WATKIN WILLIAMS WYNN, Bart., referred to the convenience of Chester as a centre for North Wales; to the cheapness of the railway fares, owing to competition amongst the railway companies; and to the importance of the Society's Show in bringing home to the Welsh agriculturists the improvement that might be made in their live stock, and in their farming generally. He felt that if they decided to come to Chester they would be very largely supported by agriculturists from all parts of North Wales.

Mr. R. A. YERBURGH, M.P., desired to emphasise most respectfully the words that had fallen from previous speakers as to the position their Society held, and as to the duties which it performed. The position which the public understood their Society to hold was that of being at the head of their great agricultural industry, its *fons et origo*, its tutor and guardian. Their object was to stimulate and encourage in the pursuit of agricultural knowledge the great agricultural class, by showing examples of improved agricultural implements, of improvements in dairying, and of improvement in live stock and produce. He ventured to urge that they would certainly do more good if their Show was attended by 150,000 visitors thirsting for agricultural knowledge than if they had an attendance of a city crowd of 500,000 persons merely out for a holiday.

Lord TOLLEMACHE thoroughly agreed with the views of the Duke of

Westminster and said that it was very important for the Cheshire farmers that the Society should, if possible, arrange to hold their Show at Chester next year.

Invitation from Manchester.

The deputation from Chester having withdrawn, Lord EGERTON of TATTON introduced a deputation from Manchester and the county of Lancaster, consisting of the Earl of Derby, K.G., the Right Hon. Sir James Fergusson, Bart., K.C.M.G., M.P., Sir Humphrey de Trafford, Bart., Mr. Alderman Mark (Deputy Mayor of Manchester), Mr. Edwin Guthrie (of the Lancaster County Council), Mr. George R. Davies, Captain Heaton (representing the Earl of Ellesmere), and Mr. Frank Whitworth (Local Secretary).

The Earl of DERBY said their case was so simple, the facts so few, but their arguments from these were so convincing, that he did not apologise for putting the matter before them very briefly. Owing to the absence of a number of gentlemen, some from illness, others from engagements, they were a smaller deputation than they had expected to be; but their importance was not to be measured by the number present. They represented, as they believed, all the leading agriculturists of the county of Lancaster, and a very considerable proportion of an enormous population. In asking that the next Meeting of the Royal Agricultural Society should be held in Manchester, they were not requesting it as a favour, though, of course, they would be very glad if they obtained what they asked. But he thought they were advising them to do that which was distinctly in the interests of the Society they represented. If the question arose as to where a Show should be held, he supposed there were three requirements that were mainly looked to: firstly, that the place chosen should be central to a large and populous district, easily accessible, and with good railway accommodation; secondly, that there should be suitable accommodation for the conveyance of visitors from a distance, and for the various articles which were to be exhibited; and, thirdly, that the neighbourhood where the Show was to be held should contain a large, well-to-do, and intelligent population, who might be expected to take interest in the proceedings, who would crowd the Showyard, and materially contribute to the receipts. He ventured to think that in all those points there was no place in the North of England which could put forward a stronger claim than Manchester. The population was more in the habit of going about by rail than in some other counties, and the number of towns and urban districts, as well as rural, from which visitors might be expected was very great. It used to be said, and he believed that it was almost, if not quite, equally true at the present time, that a radius of thirty miles from the Manchester Town Hall contained a larger population than could be found within the same radius from St. Paul's Cathedral. It was certain that there was no place out of London where there was so large a population within easy distance and conveniences of communication as was the case in Manchester. Like most people who lived in a very busy place, the Manchester people were fond of seeing sights of any kind, and were ready to pay money to see them; and he thought they might rely upon it that they would have a larger crowd in the yard, and a larger number of people from the districts round than anywhere else. On a former occasion, when the Society met in Manchester, the surplus amounted to 9,000*l.*, the largest profit ever realised at a Meeting of the Society. The Society had, in fact, never held an unsuccessful Show in Lancashire. A great many Shows had been held in other parts of the country where the results had not been so favourable, and it was thought that if they determined to hold the next Meeting in Lancashire they would have an opportunity of wiping off any deficiency incurred through losses sustained at financially unsuccessful Meetings held elsewhere, and in all probability the balance would be larger than any they had had before in Lancashire. There were 500 Members of the Society in Lancashire out of a total of 1,100 Members in the whole of the district. Therefore it was reasonable to expect

that a considerable accession of new Members, as well as means, would follow. He only knew one objection against them, and that was they would be told it was not their turn, that Lancashire had had a visit more lately than many other places. He did not imagine, however, that the Council had any rule as to the order in which they should visit any particular place, and they had to consider what would contribute most to the interests of their Society. If it were true that there were other places which had a prior claim, the objection was overruled by other considerations of a more practical kind. It was nearly twenty-four years since the last Show at Manchester, and he did not think it was an unreasonable thing for the Society to come and look at them once in a generation.

Mr. EDWIN GUTHRIE, in the unavoidable absence of the Right Hon. J. T. Hibbert, Chairman of the Lancaster County Council, stated that the visit of the Society to Manchester had the hearty approval of that body, representing the whole of the county of Lancaster. Perhaps it was customary to regard Manchester as a manufacturing centre; but Lancashire was a large county, and a very large proportion of its area was strictly agricultural.

Mr. Alderman MARK (Deputy Mayor of Manchester) apologised for the absence of the Mayor on account of a very important monthly meeting of the City Council. A communication had been received from Lord Lathom regretting his inability to be present, and expressing his best wishes for the success of the deputation. Lord Winmarleigh had also written expressing the very great interest he had taken in the Society for over fifty years, and also his sincere regret that, owing to his age and state of health, he was not able to be with them that morning. The Earl of Sefton was confined to the house by influenza, and Sir Wm. Houldsworth, their senior Member of Parliament, was unavoidably detained abroad. The Mayor of Salford was also detained by his municipal duties. The invitation from Manchester was supported by the whole strength of the county, through the County Council, and through the local agricultural societies, of which there were twenty-three, and whose Meetings were always very largely attended, showing the interest taken in agriculture by the general population of Lancashire. The invitation was also supported by nearly all the municipal corporations of Lancashire. The site upon which they relied was a very exceptional one. The picturesque park of Sir Humphrey de Trafford had been placed at the disposal of the Society with no condition or qualification whatever. The Show portion would be 110 acres, while the whole area of it was something like sixteen or seventeen hundred. The site was considered good, and, moreover, it was accessible to many lines of railway and to the great Bridgewater Canal, which, if the Ship Canal should not be completed, would be a ready means of delivery of the live stock and heavy implements to the Show ground. In appealing to the Society, they did not altogether base their claim upon the population, but they urged that commerce relied very much upon agriculture; that they were the centre of a very large agricultural district; and that Manchester was more accessible to a considerable proportion of Cheshire than any other place of importance. He believed that with the growth of population and of wealth and prosperity, the results would not be less satisfactory than at the highly successful Meeting at Manchester in 1869. They might rely upon receiving a very hearty welcome from the municipality of Manchester, and that every facility would be afforded for making the Show a great success.

Sir JAMES FERGUSSON, Bart., M.P., said he attended that day in support of the deputation as one of the Parliamentary representatives of the city of Manchester. The names attached to the subscription list would show the Society that this was not a proposal made by Manchester alone, but that it was really one which came from all Lancashire. The Council might rely that when the city of Manchester took anything in hand it did it thoroughly. There was no place in England where all exertions would be less spared to make the

Meeting a success, if they resolved to have it at Manchester. It was very desirable that the great representatives of the agricultural interest should be brought into contact with the large manufacturing centres.

Selection of Chester.

The deputations having withdrawn, Lord EGERTON of TATTON moved that Manchester be selected by the Society as the place for the Country Meeting of 1893. He said that when the choice of the Society some years ago lay between Preston and Chester, he had been in favour of the latter as the more convenient. For the same reason he was now in favour of Manchester as between that city and Chester. He agreed that, for North Wales, Chester was the centre, but for the whole of the Society's district, consisting of the counties of Chester and Lancaster, and of North Wales, Manchester was no doubt the better centre. Owing to the increase of population at Manchester and of the neighbouring districts, it was reasonable to expect that they would have a larger attendance at the Show than probably at any other place in England.

Mr. ASHWORTH seconded, on the grounds that a Meeting at Manchester would be more likely to have a satisfactory financial result than at Chester, and that in all probability this would be the last opportunity the Society would have of visiting Manchester, because both of the sites offered would probably be laid out for building purposes.

The Hon. CECIL T. PARKER moved as an amendment that Chester be selected by the Society as the place for the Country Meeting for 1893. If they went to Manchester they would be covering exactly the same ground as they had already covered three times within the last ten years. No one would think of going to Manchester on a visit of pleasure, whereas Chester was a place into which all persons poured. Americans made it their first stopping place, and hundreds of thousands of people came to Chester all through the summer. If the Society were going to put itself up to auction to the highest bidder it would be doing itself an irreparable injury.

Mr. MAINWARING, as one of the representatives of North Wales, supported Mr. Parker's amendment.

The Duke of RICHMOND and GORDON also supported the amendment. He said he had only made up his mind in favour of Chester after very considerable difficulty. His Grace then replied to some of the arguments which had been advanced by certain of the speakers in support of Manchester, and expressed his view that a visit to Chester would be, in the words of their Charter, "the most advantageous for the advancement of the objects of the Society."

Earl CATHCART said one argument in favour of Chester was that a very successful Meeting had been held in South Wales, at Cardiff, twenty years ago, when there were great crowds of intelligent agriculturists speaking the Welsh language. It was only fair that North Wales should have a similar opportunity.

After some further observations from Sir NIGEL KINGSCOTE, Mr. ASHWORTH, and others, Mr. Parker's amendment was put to the vote and carried by twenty-one votes to twenty.

It was then decided that the Country Meeting of 1893 be held at Chester, subject to the usual agreement being entered into with the Society by the Mayor and Corporation of Chester.

The deputation from Chester having been recalled, and informed by the PRESIDENT of the Council's decision, the MAYOR expressed their great pleasure at the result, and the determination of their ancient city to do all in its power to make the Meeting of 1893 a great success

Rotation of Districts for Country Meetings.

Sir NIGEL KINGSCOTE said that a letter, which he would now ask to have read, had been received from Sir Jacob Wilson, who was unfortunately too ill to be present, on the subject of the rotation of districts. Though the matter could not of course be discussed then, he thought he might say, on behalf of the Inspection Committee, that they felt very

strongly indeed the difficulty in which the Council were placed by the two rival invitations.

The following letter was then read by the SECRETARY :—

Rawlings' Hotel,
Jermyn Street, S.W.
February 2nd, 1892.

DEAR SIR,—As the Society's Show of 1893 will conclude the second series of Country Meetings which have been held in different parts of the country under the scheme for the division of England and Wales into seven districts, which was adopted by the Council in February, 1877, it appears desirable that, before another series is entered upon, an inquiry should be made by the Council as to the working of the present system.

As the Member of Council who in February, 1877, presented the recommendation of the Special Committee appointed to consider the rotation of districts, it was my intention to call attention to this matter at the meeting of the Council to be held next Wednesday.

I greatly regret that the state of my health will not permit of my personal attendance at to-morrow's meeting, as I had hoped, and I have, therefore, to request that you will be good enough to inform the Council on my behalf of my intention to move at the March meeting for the appointment of a Special Committee to inquire into the working of the present rotation of districts, and to report whether any modifications in the existing arrangements appear necessary or desirable.—Yours faithfully,

(Signed) JACOB WILSON.

The Secretary,
Royal Agricultural Society of England.

The reports of the Standing Committees were then received and adopted, as below :—

Finance.

Sir NIGEL KINGSCOTE reported his election as Chairman of the year. The accounts for the month ended December 31, 1891, as certified by the Society's Accountants, showed total receipts for that period amounting to 522*l.* 16*s.* 11*d.*, and expenditure 2,014*l.* 14*s.* 11*d.* The actual balance at the bankers on December 31, 1891, allowing for cheques outstanding, was 1,956*l.* 9*s.* 11*d.* The accounts for the month of January, 1892, showed receipts amounting to 4,809*l.* 13*s.* 9*d.*, and expenditure to 145*l.* 1*s.* 10*d.* The balance at the bankers on January 30, 1892, allowing for cheques outstanding, was 6,621*l.* 1*s.* 10*d.* Accounts amounting in all to 1,071*l.* 12*s.* 3*d.* were recommended for payment. The quarterly statement of arrears and property at December 31, 1891, was laid upon the table. The legacy of 100*l.* bequeathed to the Society by the late Mr. J. P. Stocker had been paid, less 10*l.* legacy duty, and 10*s.* legal expenses.

On the motion of Sir NIGEL KINGSCOTE, seconded by Lord BRIDPORT, it was unanimously resolved :—

That the Secretary be authorised to issue to any candidate for election as a new Member, who may make application on or before Saturday, February 27, a ticket of admission to the forthcoming Horse Show at the Royal Agricultural Hall, provided that the usual form of undertaking has been previously signed by the candidate, and that his subscription for the current year has been paid.

House.

Sir NIGEL KINGSCOTE reported his election as Chairman of the year, and the recommendatiens of the Committee as to various matters connected with the house.

Journal.

Earl CATHCART reported his election as Chairman of the year. Part IV. of Vol. II. of the Journal had been published in due course on January 1; and the Committee presented their recommendations as to the payments to contributors. The Secretary had reported the publication of the Society's Text Book on Agriculture on January 1 last, and that two editions had been already exhausted. The arrangements for the issue of the third edition were left for settlement by the Education Committee. Various applications for

permission to reproduce certain articles and illustrations in the Journal had been granted on the usual conditions. The Committee recommended that the Pasteur Institute at Paris be placed upon the Society's free list for copies of the Journal, in exchange for copies of the "Annales de l'Institut Pasteur," as issued. Preliminary consideration had been given to the proposed arrangements for the next number of the Journal; and a variety of suggestions for articles and notes had been considered, and directions given thereon.

Earl CATHCART said it was only due to Dr. Fream to say how very satisfactory his work had been with regard to the text-book. They were very much obliged both to Dr. Fream and to the Education Committee, who had arranged the matter.

Chemical.

Mr. DENT reported the election of Lord Emlyn as Chairman for the year. The report of the Woburn Sub-Committee had been received and adopted, and various matters connected with the Chemical Department and Laboratory discussed and settled.

Seeds and Plant Diseases.

Mr. BOWEN-JONES reported that Mr. Whitehead had been elected Chairman of the year. A letter had been received from Mr. Whitehead apologising for his absence through ill-health, and urging the Committee to recommend renewed and extended experiments on potatoes with Bouillie Bordelaise during the forthcoming season. The Committee recommended that such experiments should be again undertaken by the Council, and that details of the experiments be settled at the March meeting. Mr. Carruthers had undertaken to carry out a separate inquiry into the exact nature of the effect of the Bouillie Bordelaise upon the potato disease fungus, especially as to wherein lay the efficacy of the mixture in the destruction of the organisms. The suggestion made at the General Meeting of the Society in December by Mr. J. Kersley Fowler, "that the Society should take further steps to encourage in this country the growth of sugar beet and the manufacture of beetroot sugar," had been considered, but the Committee did not see their way to recommend that any definite steps in regard to this matter should be taken by the Society at the present moment.

Veterinary.

Sir JOHN THOROLD reported his election as Chairman of the year. Professor Brown had submitted the annual report for 1891 of the Royal Veterinary College, which the Committee recommended for publication in the Journal (see page 116). A revised edition of Professor Brown's pamphlet on "Animals of the Farm in Health and Disease" was now in the press, and would be issued in a few days. The deaths were reported of Mr. Osborn Hills, of Leamington, and Mr. J. B. Polding, of Red Lion Street, Burnley, the Society's Provincial Veterinary Surgeons respectively for the counties of Warwick and Lancaster. The Committee recommended the appointment of Mr. Joseph H. Carter, F.R.C.V.S., of Burnley, in the room of Mr. Polding. The examiners in cattle pathology for the diploma of the Royal College of Veterinary Surgeons in 1891 having reported that the following gentlemen, placed in order of merit, had attained the greatest distinction—(1) Mr. G. H. Williams, Riverside, West Drayton; (2) Mr. M. T. Sadler, Burton-on-Trent—the Committee recommended that the Society's large medal be given in silver to Mr. Williams, and in bronze to Mr. Sadler.

Professor Brown had presented the following report:—

> PLEURO-PNEUMONIA.—During the four weeks ended January 23, 1892, thirty-one outbreaks of "pleuro-pneumonia" were reported to the Board of Agriculture. In five of these the local veterinary surgeons employed by the Board detected the existence of other diseases without slaughtering. In twenty-six instances a test animal was slaughtered for the purpose of diagnosis, when eight were found affected with pleuro-pneumonia, and eighteen with other diseases of the lungs. There were twenty-eight cattle, affected with the disease, slaughtered, and also 317

healthy cattle, which had heen exposed to the risk of infection.

ANTHRAX.—There were twenty-one fresh outhreaks of this disease reported in Great Britain in the four weeks. They occurred in the counties of Devon, Essex, Hunts, Leicester, London, Northampton, Northumherland, Westmoreland, and York, W.R., in England, and in Aberdeen, Elgin, Midlothian, Nairn, and Perth in Scotland. Of the thirty-five animals attacked one was killed, thirty died, and one recovered.

SWINE FEVER.—In Great Britain 117 outhreaks of swine fever were reported in the four weeks, 871 pigs were attacked, 439 diseased swine were killed, 375 died, 143 recovered, and 210 remained alive when the last return was made up.

Stock Prizes.

Mr. FOSTER reported the election of Mr. SANDAY as Chairman of the year. The Earl of Coventry and Mr. Stratton had heen added to the Committee. Offers of Champion Prizes received from the Clydesdale Horse Society, the Shropshire Sheep Breeders' Association, and the British Berkshire Society had heen accepted. A letter from an exhihitor of pigs, protesting against the new regulation of the Society, requiring pigs to be entered or eligihle to he entered in the Herd-hook, had been considered; but the Committee recommended that the regulation he adhered to.

Judges' Selection.

Mr. FOSTER reported that the question of the appointment of two Judges instead of three, of which he had given notice at the Council meeting held on Decemher 9 last, had been discussed, and it had been unanimously resolved to recommend the adoption of this proposal. It had further been unanimously resolved that the names of the Judges should he published hefore the closing of the entries. The Committee had selected a list of Judges to he invited to act, on the usual terms, for the various classes of stock, &c., at the Warwick Meeting.

Implement.

Mr. FRANKISH reported his election as Chairman of the year. The necessary preparations for the conduct of the plough trials at Warwick had heen made. The competitors will be required to provide their own horses. In the dynamometer tests, the ploughs will be hauled by steam power. In such tests a new share may he used, but it must be of exactly the same pattern and dimensions as that used in the trials themselves. Letters of acceptance had heen received from the three gentlemen nominated to act as Judges of ploughs at the forthcoming trials. The Committee recommended the Council to provide a field for the owners of steam-diggers of the "Darhy," "Proctor," or similar type, to show their implements in operation at Warwick during the summer Meeting.

General Warwick.

Mr. DENT reported that the first inspection of the competing farms had heen compulsorily postponed, in consequence of the frost and snow, from January 11 to the 25th, hut that the Judges were now at work, and would finish their inspection on Saturday next. The Committee recommended that the prices of admission on the several days he as under:—Saturday, June 18, 2*s.* 6*d.*; Monday, 22, 5*s.*; Tuesday and Wednesday, 2*s.* 6*d.* each day; Thursday and Friday, 1*s.* each day; and that the band of the Royal Warwickshire Regiment he engaged to play on the Tuesday, Wednesday, Thursday, and Friday of the Show.

Showyard Works.

Mr. ALLENDER reported the election of Sir Jacob Wilson as Chairman of the year. The form of tender for refreshments at the Warwick Meeting had been approved and ordered to be issued, the tenders to he returnahle hy Monday, the 29th inst. A letter had heen read from a firm of intending exhihitors stating that they would require space at Warwick, provided they could depend upon a sufficient supply of gas, and the Committee recommended that they be informed that the Council

could not give any undertaking as to the supply of gas in the Showyard.

Selection.

Earl CATHCART reported his election as Chairman of the year, and stated that letters had been received from Professor Hellriegel and Dr. Sickesz, thanking the Society for their election as Honorary Members.

Education.

Mr. PIDGEON reported the election of Lord Moreton as Chairman of the year. Copies of the Society's text-book on agriculture, which was published on January 1 last, had been laid upon the table, and the Secretary had reported that the first edition having immediately run out of print, a second and much larger edition had, with the approval of the Chairman, been printed. This edition, published on January 20, having also been exhausted, the Committee recommended that a third edition be immediately prepared, including any alterations made by the author, as the result of suggestions received.

Dairy.

Sir JOHN THOROLD reported the election of the Hon. Cecil T. Parker as Chairman of the year. A further letter had been received from Viscount Hampden, President of the English Jersey Cattle Society, as to the proposed prizes for dairy cattle, subject to a butter test by the churn, and asking the Dairy Committee to explain the nature of the "practical difficulties" in the way of such a test. The Committee, after further consideration of the matter, recommended that the Secretary be instructed to inform Lord Hampden that the objection of the Committee was not based upon a question of principle, but that in their opinion it would be impossible to carry out in the Showyard in the manner proposed, with the means and time at the Society's disposal, trials with results scientifically accurate and, therefore, absolutely reliable. The Committee had carefully revised the "Simple Rules for Butter-making," the last edition of which was now out of print, and they recommended that a new edition, as altered, be printed and issued forthwith. The question of the judging of dairy implements was discussed, and the Committee recommended that in future a Judge skilled in Dairy matters should be appointed to act with the Judges of Miscellaneous Implements in their inspection of the Dairy Implements entered for the Society's Silver Medals.

Suggestions made at General Meeting.

The suggestions made by Members at the General Meeting, held on December 10 last, were then considered. The suggestions of Mr. George Barham and Mr. C. F. Hope as to railway rates, fares, &c., were noted for future consideration in connection with the general railway arrangements for the Society's Shows; Mr. Kersley Fowler's suggestion as to trials of steam-cultivating machinery was dealt with by the recommendation of the Implement Committee as to Steam-diggers at Warwick; and as to Mr. Fowler's second suggestion, that the Society "should take further steps to encourage in this country the growth of sugar beet and the manufacture of beetroot sugar," the Council did not see their way to take any steps in this matter, in view of the fiscal and economic difficulties involved in the question.

Miscellaneous.

A letter was read from the Mansion House United Association on Railway Rates, asking the Society to make an annual subscription to its funds. The consideration of this letter was postponed, but the Duke of RICHMOND and GORDON intimated that he should object to the Society subscribing to the Association, as the railway rates question had now been practically settled.

Other formal business having been transacted, the Council adjourned until Wednesday, March 2 next, at noon.

WEDNESDAY, MARCH 2, 1892.

THE EARL OF FEVERSHAM (PRESIDENT) IN THE CHAIR.

Present:—

Trustees.—Earl Cathcart, Mr. John Dent Dent, Lord Egerton of Tatton, Earl of Ravensworth, Duke of Richmond and Gordon, K.G., Sir M. W. Ridley, Bart., M.P.

Vice-Presidents.—Mr. H. Chandos-Pole-Gell, Earl of Lathom, Sir Massey Lopes, Bart., Lord Moreton, Sir J. H. Thorold, Bart., Mr. Charles Whitehead.

Other Members of Council.—Mr. G. M. Allender, Mr. J. H. Arkwright, Mr. Alfred Ashworth, Mr. Joseph Beach, Mr. J. Bowen-Jones, Mr. Charles Clay, Earl of Coventry, Lieut.-Col. J. F. Curtis-Hayward, Mr. Alfred Darby, Mr. J. Marshall Dugdale, Mr. William Frankish, Mr. R. Neville Grenville, Mr. Anthony Hamond, Mr. James Hornsby, Mr. Charles Howard, Mr. C. S. Mainwaring, Mr. Joseph Martin, Mr. T. H. Miller, Mr. P. A. Muntz, M.P., Hon. Cecil T. Parker, Mr. Albert Pell, Mr. Dan. Pidgeon, Mr. J. E. Ransome, Mr. S. Rowlandson, Mr. G. H. Sanday, Mr. W. T. Scarth, Mr. A. J. Smith, Mr. Henry Smith, Marquis of Stafford, Mr. E. W. Stanyforth, Mr. Martin J. Sutton, Mr. Garrett Taylor, Mr. J. P. Terry, Mr. John Tremayne, Mr. R. A. Warren, Mr. E. V. V. Wheeler, Mr. C. W. Wilson.

Officers.—Mr. Ernest Clarke, Secretary and Editor; Dr. J. Augustus Voelcker, Consulting Chemist; Mr. Wilson Bennison, Surveyor.

Mr. A. C. Cope, of the Board of Agriculture.

The following members of the Warwick Local Committee were also present:—Lord E. J. Seymour, the Mayor of Warwick (Mr. J. W. Mann), the Mayor of Leamington (Mr. John D. Barbour), the Town Clerk of Warwick (Mr. Brabazon Campbell), Mr. J. W. Margetts, Mr. T. H. G. Newton, and Mr. Frederick H. Moore (Secretary of the Local Committee).

Apologies for Non-Attendance.

Apologies for non-attendance were received from General Viscount Bridport, G.C.B., Viscount Emlyn, Lord Brougham and Vaux, Col. Sir Nigel Kingscote, K.C.B., Sir Jacob Wilson, and Mr. Walter Gilbey.

The late Duke of Clarence.

The minutes of the last meeting of Council held on February 3 having been approved,

The PRESIDENT announced that, in obedience to the instructions given by the Council, the Addresses of Condolence to Her Majesty the Queen and to Their Royal Highnesses the Prince and Princess of Wales had been engrossed on vellum, enclosed in appropriate boxes, and sent to the Secretary of State for the Home Department,[1] and to the Comptroller and Treasurer to H.R.H. the Prince of Wales. From the latter the following reply had been received, which the Council would doubtless wish to have entered upon the minutes:—

> Sandringham, Norfolk.
>
> General Sir Dighton Probyn is desired to convey to the President and Council of the Royal Agricultural Society, the sincere thanks of the Prince and Princess of Wales, for the warm sympathy they have expressed on the occasion of Their Royal Highnesses' great bereavement.
>
> 24th February, 1892.

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[1] After the rising of the Council, the following letter was received from the Secretary of State for the Home Department:

Whitehall, 2nd March, 1892.

MY LORD,—I have had the honour to lay before the Queen the loyal and dutiful Address of the President and Council of the Royal Agricultural Society of England, on the occasion of the death of His Royal Highness the Duke of Clarence and Avondale, K.G.; and I have to inform your Lordship that Her Majesty was pleased to receive the Address very graciously.

I have the honour to be, my Lord,
Your Lordship's obedient servant,
(Signed) HENRY MATTHEWS.

Earl of Feversham.

Election of New Governors and Members.

The election of the following two Governors and 141 Members was proceeded with :—

Governors.

CAVENDISH, Victor C. W., M.P...Devonshire House, Piccadilly, W.
EMLYN, Viscount..Golden Grove, Carmarthenshire.

Members.

ANDERSON, R...Brandon Wood, Coventry.
ANSTICE, R. E...Madeley Wood, Salop.
ARCHER, James..Oxford.
ARNOLD, S...Maxtoke Farms, Coleshill.
ATKINSON, T. S...Douglas, Isle of Man.
BACHE, T. P...Stakenbridge, Worces.
BAKER, S., jun...Sea Stud Farm, Ilminster.
BANNISTER, W. S...Rowley's Green, Foleshill.
BARLOW, L...Betchton House, Sandbach.
BARR, P...12 King St., Covent Garden, W.C.
BARTHOLOMEW, C. W...Blakesley Hall, Towcester.
BATH, C...Gear Farm, Camborne.
BLAKE, J...Stretton Old Hall, Malpas.
BELL, H. E...Hartford Farm, Cramlington.
BRAND, J...Sanderstead Court, Croydon.
BROCKLEHURST, H...Sefton Pk., Liverpool.
BROUGHTON, J...39, Market Place, Banbury.
BURDON, A. E...Hartford Ho., Cramlington.
BYFORD, G. F...Ruthin.
CATTELL, H. J...Elmdon, Birmingham.
CLARKE, A...3, Stanhope Gardens, W.
CLARKE, T...Allerton Hall, Woolton, Lancs.
COBB, G. A...Theobald's Pk., Waltbam Cross.
COLEMAN, F. F...Sandwich, Kent.
COLQUHOUN, W. E. C...Cbartwell, Westerham.
COOKE, C. E. E...Hinxton Grange, Cambs.
COOKE, S. A...Beckley, Oxon.
COOPER, J...Tandridge Conrt, Surrey.
CORBETT, R. C...Walton Street, Aylesbury.
CORDER, R...Old Hall, Claydon, Ipswich.
COWPER, F. C...Carleton Derick, Penrith.
CRADDOCK, F...Lyneham, Chipping Norton.
DANIELL, A. S...Fairchildes, Warlingham.
DAVIDSON, J. I...Saughton Mains, Gorgie, N.B.
DAVIES, J. H...Hatton, Warwick.
DAVIS, J...The College, Cleobury Mortimer.
DEAN, T...Stubley Farm, Morley, Leeds.
DE CLERCQ, L...5, Rue Masseran, Paris.
DENNIS, F...Woodrow, Eastgate, Louth.
DONKIN, R., jun...Rothbury, Northumberland.
DOWSON, John, Danby Castle, Yorkshire.
EDE, C. P...Creighton Park Farm, Uttoxeter.
EDMONSON, E...Springfield Hall, Knowle.
EDWARDS, P...Dodleston, Chester.
ELLIS, A. C...Thriplow, Royston.
[1] FORTUNE, W...15, Davisville Rd., Shepherd's Bush, W.
GATES, G. A...Lock Farm, Ashurst.
GIBBON, J. S...Newton House, Cowbridge.
GIBSON, J. M...Buckley, Flintshire.
GILBERT, F...Billinghay, Lincoln.
GLENDINNING, G. R...Hatton Mains, Kirknewton, N.B.
GOODWIN, E. R...268, Friern Rd., East Dulwich'
GOWER, G. C. G. Leveson-..Titsey Place, Surrey.
GROLLIER, L...39, Rue Cardinet, Paris.
HADLEY, E. B...Claytons Ho., Tunbridge Wells.
HAMAR, E...Bieton, Clun, Salop.
HANCOCK, E...The Fields Farm, Southam.
HARTAS, J. G...Staindrop, Darlington.
HAY, J...Widdrington Colliery, Acklington.
HEASMAN, W...Oxted, Surrey.

[1] Reinstated under Bye-law 12.

HEBLETHWAITE, J. W...Green Bank, Chester.
HERBERT, E. W...Orleton, Wellington, Salop.
HOARE, G...Brookside, Andover.
[1] HODGKIN, W. H...San Ricardo Vineyard, Fresno, California, U.S.A.
HODGSON, V...Staindrop, Darlington.
HOGG, W. H. J...Moorhouse, Limpsfield, Surrey.
HOLLIS, C. H...Thornville House, Darlington.
HOMFRAY, H. R...Penllyn Castle, Cowbridge.
HOPE, H...Orwellmains Farm, Dunbar, N.B.
HORNBY, H. P...St. Michael's-on-Wyre, Garstang.
HUNT, J...Dove Ho., Shustoke, Birmingham.
JAMES, B. S...Church Eaton, Stafford.
JOBLING, T. E...Blyth, Northumberland.
JORDAN, H...Charlton Kings, Cheltenham.
KELLY, T...Clypston, Douglas, Isle of Man.
KEMP, G...Manor Farm, Sedgebrook.
KENT, J...Lincoln.
KING, J. R...Bozedown Ho., Whitchurch, Oxon.
LANDALE, D. G...Limpsfield Grange, Surrey.
LEARMOUNT, W. D...3 Ravensbourne Ter., South Shields.
LIDDELL, C...Peasmarch Place, Sussex.
LIDDELL, C. L...Peasmarch Place, Sussex.
LILWALL, T. H...25 Victoria St., Hereford.
LINGWOOD, H...The Chesnuts, Needham Mkt.
LITTLE, A. O...Hartham Park, Corsham.
[1] LOVEDAY, J. E. T...Williamscote, Banbury, Oxon.
MCMECHAN, Samuel J...Manchester.
MALTBY, John..Benington, Boston.
MASTER, C. H...Barrow Green Ho., Oxted.
MAYBURY, A. C...D.Sc., 19 Bloomsbury Square, W.C.
MIDDLETON, C...Worksop, Notts.
MILBURN, B...Newsham Pk. Farm, Newcastle.
MILES, E...Hatton Rock, Warwick.
MITCHELL, H...Longnor Hall, Penkridge.
MITCHELL, J...Toft Hill, Dunchurch, Rugby.
MOFFITT, G. S...Field House, Acklington.
MOODY, G. G...Deer Park, Limavady.
MORRIS, S...Lower Berse, Wrexham.
NORMAN, W...Union Street, Liverpool.
ORR, A...The Priory, Hornby, Lancaster.
PALMER, T...Hampton Lodge, Warwick.
PAYTON, H. G. Godfrey..Warwick Castle E. O.
PEAKE, G. H...Westholme, Sleaford.
PEARCE, A. H...Toddington, Glos.
PEPLOE, D. H. T...Garnstone, Weobly.
PETER, J...Kingscote, Wotton-under-Edge.
PIKE, W. C...Warren Hill, Oakley, Suffolk.
PLUMMER, C. H. S...Sunderland Hall, Selkirk, N.B.
POCKLINGTON, Lt.-Col. G. H...30 Roland Gardens, S.W.
PRATT, C...Grange Fm., Budbrooke, Warwick.
PREWETT, W...Miles Farm, Horsham.
RAMSDEN, A. H...Canon Bridge, Eaton Bishop.
REED, T...Ufton, Southam.
ROBERTS, J...St. Mellons, Mon. (Cardiff.)
ROBERTSON, R. T...The Firs, Hatton, Warwick.
SCOTT, G. S...Offham, Maidstone.
SHEKELL, T. S...Pebworth, Glos.
SHEPHEARD, P. E...Hunningham, Leamington.
SMITH, W. R...Glendale, Kilmorey Park, Hoole, Chester.
SPARKE, C. J. E...St. Andrew's Castle, Bury St. Edmunds.
STEVENSON, F. S...Playford Mount, Woodbridge.
STUBBER, R. H...Moyne Ho., Durrow, Queen's County.
STYRING, J. D...Manor Ho., Whiston, Rotherham.

[1] Reinstated under Bye-law 12.

TAYLOR, J. W...Carshalton Park, Surrey.
THOROLD, Rev. A. C. E...Hougham-cum-Marston, Grantham.
TINKLER, J. W...Staindrop, Darlington.
TOPHAM, W...The Limes, Chester.
TREE, A. M...Ashorne Hill, Leamington.
TUCKER, J. H...Bartrim, Campden.
TURNER, T. jun...Aldwarke, Rotherham.
WALLING, W., jun...Seisdon, Wolverhampton.
WARDE, Lt.-Col. C. A. M...Squerryes Ct., Kent.
WARWICK, E...Eye, Peterborough.
WATSON, J. R...South Mosses, Arlecdon, Cumb.
WATTS, H...Stanton St. John, Wheatley.
WATTS, J...21, Church St., Warwick.
WICKHAM, H...Nettlestead Court, Kent.
WILKES, G. W...Chadwick Manor, Knowle.
WINTER, H. D...Shotesham St. Mary, Norwich.
WOOD, W...Habrough, Ulceby.
WYNNE, R...Sunt Farm, Edenbridge.

The reports of the Standing Committees were then received and adopted as below:—

Finance.

Sir MATTHEW RIDLEY (in the unavoidable absence, from an attack of influenza, of the Chairman, Sir Nigel Kingscote,) reported that the accounts for February, 1892, as certified by the Society's accountants, showed total receipts amounting to 1,118*l*. 12*s*. 1*d*. and expenditure 1,071*l*. 17*s*. 5*d*. The balance at the bankers' on February 29, allowing for cheques outstanding, was 6,667*l*. 16*s*. 6*d*. Accounts amounting in all to 1,593*l*. 16*s*. 8*d*., were passed, and were recommended for payment. Copies were laid upon the table of the balance sheet for 1891, which had been duly passed by two of the auditors, Mr. C. G. Roberts and Mr. A. H. Johnson, at an audit held on Monday last, February 29. The final result of the year was that after writing off the customary percentages for depreciations, the Society's total assets on December 31, 1891, were 34,934*l*. 11*s*. 6*d*., as against 35,176*l*. 13*s*. 2*d*. at the end of 1890. The Committee reported with regret the resignation through ill-health of Mr. Francis Sherborn, the Society's senior auditor, after a service of twenty-five years.

Resignation of Senior Auditor.

Sir MATTHEW RIDLEY, in presenting this report, said that the Council would observe with regret the resignation by Mr. Francis Sherborn of the post of auditor, which he had filled with so much advantage to the Society for the long period of twenty-five years. Lord Bridport, who moved the appointment of Mr. Sherborn at the general meeting of members held on December 11, 1866, was sorry that, owing to his having been summoned to Windsor by Her Majesty, he was unable to be present to speak of the value of the services which Mr. Sherborn had rendered to the Society during the last quarter of a century; but he (Sir Matthew) was sure it would be the wish of the Council that their appreciation of those services should be placed on record. As the Finance Committee had announced in their report, the audit of the accounts for 1891 was held on Monday last. As it was uncertain whether this audit could be held at the time appointed, owing to the necessity of two auditors being present, and one only having responded to the summons, the Chairman of the Finance Committee had invited Mr. S. B. L. Druce, a duly qualified member of the Society, to assist in the audit, in case his services should be required. Fortunately, Mr. C. Gay Roberts and Mr. A. H. Johnson were both able to attend, so that it was not necessary to trouble Mr. Druce on this occasion. The bye-laws did not make specific provision as to the appointment of an auditor, except at "the general meeting held in London in December of every year," when it was provided that three members "shall be elected as auditors of the Society's accounts for the ensuing year." All the three present auditors had been elected at the December general meeting: Mr. Sherborn in December, 1866, Mr. Roberts in December, 1882, and Mr. Johnson in December, 1884. It would appear, therefore, that no definite appointment of a third auditor could be made until December next; but as it was obviously undesirable that any duly-appointed audit should fail through the absence of one of the two remaining auditors, the Council would probably think it well that there should be a gentleman in reserve to assist in the audit, if necessary; and the Finance Committee thought no more acceptable nomination could be made than Mr. Druce, who bore an honoured name that had been associated with the Society from its earliest foundation. (Hear, hear).

Amount of Prizes for Stock.

Mr. TERRY said he would like to ask the Finance Committee whether they were in a position to provide a larger sum than at Warwick for the purpose of framing a prize sheet for the Chester Meeting. He found, on comparing Doncaster with Warwick, that for the latter show the sum allotted for stock prizes was less by 1,289*l.*, of which 969*l.* less was given by the Society. They had had great difficulty in framing the prize sheet for the Warwick Meeting, and they had been compelled to leave out many important breeds, and also to reduce the value of prizes to a considerable extent. He felt that as the show this year was to be held at Warwick, they should not have been compelled to cut out those prizes, because the place of meeting was so central that stock could get there from all parts of the country. He thought that, both as an inducement for people to attend the show of the Society, and also to get new members to join, prizes for every important breed of stock should be given. He only asked the question to ascertain if the Committee would be in a position to allow them a little more money for that purpose, because he was sure it would be for the advantage of the Society.

Sir MATTHEW RIDLEY said that, as Chairman of the Committee for that day only, he was not in a position to give any positive answer to the question put to him, and it was rather premature to ask the Finance Committee to commit themselves to anything further. On the whole, he thought the finances of the Society might be considered to be in a very satisfactory position.

Mr. DENT suggested that the £600 awarded in London as premiums for thoroughbred stallions might be applied for the purposes indicated by Mr. Terry.

Mr. TERRY said he raised the question that day because Sir Nigel Kingscote, at the April meeting of last year, announced the sum which they were prepared to grant to the Stock Prizes Committee.

Sir MATTHEW RIDLEY pointed out that the Finance Committee was a body controlling the expenditure, and was not the proper committee to initiate it.

Journal.

Earl CATHCART (Chairman) reported that Mr. Terry, as one of the Judges of farms, had attended the Committee to ask directions as to the necessity of a further visit being paid to a number of farms, which in the opinion of the Judges had no chance of being placed in the final awards; and it had been decided that the matter should be left for settlement by the Judges themselves. The Committee had passed various accounts for printing, duly examined by the printing auditor. Copies were laid upon the table of the third edition of the Society's Text-Book on Agriculture, and of a new edition of Prof. Brown's pamphlet of "Animals of the Farm in Health and Disease." The Editor had submitted his proposed arrangements for the forthcoming number of the Society's Journal, which had been considered and approved. Various suggestions for articles and notes had been discussed, and directions thereon given. The question had been discussed of the issue of the monthly proceedings of the Council, as sent to members of the Council, to members of the Society who might express a wish to have them. The Committee recommended that the Secretary be authorised to forward any member copies of the monthly proceedings, as issued, subject to payment of the nominal sum of 1*s.* per annum to cover the cost of printing and postage.

Chemical.

Mr. WARREN, in the absence of Viscount Emlyn (Chairman), submitted the report of the Committee on various matters of detail in connection with the laboratory, and also their usual quarterly report. The Woburn Sub-Committee were proposing to arrange for some experiments with *Bouillie Bordelaise* as a remedy for potato disease during the coming season.

On the motion of Mr. WARREN, the Quarterly Report of the Chemical Committee was formally adopted by the Council, and ordered to be published in the next number of the Society's Journal—(see page 125).

Seeds and Plant Diseases.

Mr. WHITEHEAD (Chairman) reported that the eight diagrams of the wheat plant, which had been reproduced under the direction of the Society's Consulting Botanist, from the original drawings of Bauer, in the Botanical Department of the British Museum, were now ready, together with an explanatory pamphlet on the wheat plant. The Committee had decided that the complete set of these eight diagrams should be published at the price of 10*s.* per set, including the pamphlet, and should be issued through the Society's agents for diagrams, Messrs. W. and A. K. Johnston, 5, White Hart Street, Warwick Lane, E.C.

The proposed scheme for the new experiments during the forthcoming season with *Bouillie Bordelaise* as a remedy against potato disease had been carefully considered, and the Committee now brought up the following detailed recommendations on the subject:

Scheme for Potato Experiments.

The general plan of last year's experiments to be followed, no important modification being called for.

Confirmation of the experiments of last year is required, inasmuch as the *Bouillie Bordelaise* did not show any effect in checking the disease, although the crop was in some cases increased by the application.

The question for decision is still whether the *Bouillie* prevents or checks the disease.

Districts.—Six different localities to be chosen, five in England—viz., in the counties of Kent, Beds, Devon, Lincoln, and Lancaster, and one in (South) Wales.

Variety of Potato.—Wherever possible, experiments to be made upon one and the same selected farm, with (*a*) an early variety of potato; (*b*) the main crop; (*c*) a late variety. If this should be impossible, the three crops to be selected on different farms in the same locality, as near to one another as possible. If it should be impossible to obtain the three different crops in the same locality, the experiment must be confined to two crops, or even to one.

Size and Number of Plots.—The minimum size of an experimental plot to be $\frac{1}{4}$ acre. The size recommended is $\frac{1}{2}$ acre.

Each experiment on any one variety of potato to consist of three plots:—

Plot A.—For *early* application of the *Bouillie.*

Plot B.—For *late* application of the *Bouillie.*

Plot C.—to be left *untreated.*

Thus, if all three crops (early variety, main crop, late variety) are available on a farm, there should be nine plots in the experiment; if only two crops are available, then six plots; if only one crop, then three plots.

Arrangement with Experimenters.—The Society will undertake to pay the expenses of purchasing and forwarding sulphate of copper and lime, as also all reasonable expenses for labour of application of dressing, carriage hire, &c., but cannot undertake responsibility for any loss of crop.

Superintendence of Experiments.—The Society will provide for the necessary superintendence at the time when the *Bouillie Bordelaise* is applied to the potatoes, and also when the weighing of the crop takes place. The services of a farm labourer will be required at each experimental station for the actual application of the dressings under the direction of the superintendent.

The cost of the potato experiments, including contingencies, was estimated not to exceed £200, and the Committee moved for a grant for that amount for the purpose. Miss Ormerod had presented her quarterly report, which the Committee recommended for publication (see page 132).

The Hon. C. T. PARKER said he did not understand whether the proposed potato experiments were for the benefit of the Board of Agriculture, or on the Society's own account.

Mr. WHITEHEAD replied that it was proposed to organise the experiments in the same way as last year, not for the benefit of, but in co-operation with, the Board of Agriculture. The Board had contributed 100*l.* towards the expenses of last year's experiments, which amounted in all

to 130*l.* 10*s.* 5*d.*, and would no doubt contribute towards the expense of the further experiments this year.

The Hon. CECIL T. PARKER was of opinion that the Society should not act for the Board of Agriculture, but should keep the matter entirely in its own hands.

Earl CATHCART pointed out that such experiments as these were a part of the Society's regular business, and ought to be carried out on their own responsibility. The Board of Agriculture was a political body, whilst the Royal Agricultural Society was a perfectly free and independent institution.

The Duke of RICHMOND and GORDON quite concurred with Lord Cathcart. They should be extremely careful as to their relations with the Board, and they should have nothing whatever to do with politics.

In reply to a suggestion that the report should be referred back to the Committee,

Mr. WHITEHEAD said he thought they were pledged to the Board of Agriculture to carry out these experiments.

Mr. DENT said that the Woburn Sub-Committee had decided to have independent experiments with *Bouillie Bordelaise* at the Woburn Farm under the direction of their own manager; but they did not wish these experiments to be mixed up with those conducted for the Board of Agriculture.

After some further discussion, in which Earl CATHCART, Mr. WHITEHEAD, Sir JOHN THOROLD, the Hon. C. T. PARKER, and others took part,

Sir MATTHEW RIDLEY said that, as the Society had accepted the Board of Agriculture's cheque for 100*l.*, he thought they were more or less pledged to go on with these particular experiments. At the same time he quite agreed with other speakers as to the general relations of the Society with the Board.

The report of the Committee was then adopted without opposition.

Veterinary.

Sir JOHN THOROLD (Chairman) reported that a discussion had taken place in Committee upon the recent outbreak of foot-and-mouth disease; and the various Orders issued by the Board of Agriculture since the occurrence of the disease were laid upon the table. A letter had been received from Mr. J. H. Carter, F.R.C.V.S., accepting the terms of his appointment as Provincial Veterinary Surgeon for Lancashire. A revised edition had just been issued of Professor Brown's pamphlet on "Animals of the Farm in Health and Disease." A report had been received from Mr. Roberts, Provincial Veterinary Surgeon for the County of Flint, as to the absence of swine-fever, and the prevalence of influenza amongst horses. The Committee had considered the results of the experiments carried on at the Royal Veterinary College as to foot-rot in sheep, which were given in the annual report of the College, to appear in the forthcoming number of the Journal (see page 116). The experiments tended to show that foot-rot was communicable from diseased to healthy animals, after longer or shorter intervals, dependent upon the conditions of exposure to infection.

Mr. COPE (for Professor Brown) had presented the following report:—

> FOOT-AND-MOUTH DISEASE.—Since the last meeting of the Committee, foot-and-mouth disease, which has been absent from this country for about six years, has suddenly made its reappearance within the Metropolitan district. The first animals found to be affected with the disease were some Danish cattle, which were in the lairs in the Metropolitan Cattle Market on February 4, affected in a comparatively early stage. Immediately precautions were taken by closing the market gates and slaughtering all the animals which were then within the lairs and market. It subsequently transpired that the Danish cattle referred to were landed in this country on Saturday, January 30, and brought up to the market lairs on the following day (Sunday), and were exposed for sale in the market on Monday, February 1, but it was not until Thursday, February 5, that the disease became apparent in them. Since February 4, eight outbreaks have been detected in

the cowsheds of London, the last outbreak being on February 20, and although the cowsheds in London are being visited almost daily by a large staff of Veterinary Surgeons, up to February 29, no further cases have been detected in them. It has now been ascertained that the disease must have existed in the Metropolitan Cattle Market on February 1, because not only have several of the outbreaks in London cowsheds been traced to certain animals which were bought on that day in the Metropolitan Market, but other outbreaks have occurred in the counties of Kent, Sussex, and Surrey, which are traceable directly or indirectly to the movement of cattle out of that market on the same day. The outbreaks in Kent have occurred at Chatham, Rochester, Welling, Minster (in the Isle of Sheppey), Blane (near Canterbury), Folkestone, and Cheriton (near Folkestone), at which latter place it has extended to adjoining farms. In Sussex the disease first appeared at Cuckfield, near Hayward's Heath, and was traced to certain sheep brought from the Metropolitan Market to Hayward's Heath sale yard, and subsequently removed to Cuckfield, and an outbreak has occurred at Partridge Green, which is in the neighbourhood of Cuckfield. In Surrey the disease first appeared in the neighbourhood of Croydon, where it has extended to other premises, and an outbreak has occurred at Ash, which is on the borders of Surrey and Hants. One outbreak has occurred at Edgware, in the county of Middlesex. On Saturday a telegram was received from Edinburgh stating that the disease had appeared in a cowshed in that city, but no satisfactory explanation has been as yet obtained as to how the infection was introduced to these premises. Every possible means have been taken by the Board to arrest the extension of the disease; in some instances the Board, and in other instances the Local Authorities, have slaughtered the animals on the premises with a view of stamping it out; in every other case strict isolation, combined with disinfection of persons and all things which had been in contact with diseased animals, has been rigidly enforced. Up to the time of writing (notwithstanding the fact that the disease must have existed in this country since February 1) the measures taken by the Board appear to have had the effect of confining it to the district of London and the counties of Kent, Sussex, and Surrey, and, with the exception of the outbreak reported in Edinburgh, nothing has been reported North of the Metropolitan district. Including the cattle which were found affected with the disease in the Metropolitan Market, twenty-seven outbreaks have been reported. Many of them, as has been previously stated, have been stamped out, and the following are the only centres in which it is known to exist at the present time, viz., at Minster (Isle of Sheppey), Folkestone, Cheriton and Newington, which are near to Folkestone, and Blane, near Canterbury, all these places are in the county of Kent; at Partridge Green in the county of Sussex; on premises in the neighbourhood of Croydon; and at Ash, in the county of Surrey; in one cowshed in London; and in another in the city of Edinburgh. The Board has issued Orders prohibiting the movement of animals out of all these counties; and the holding of all public and private sales in the whole of these districts (except for immediate slaughter) has been stopped.

PLEURO-PNEUMONIA. — During the four weeks ended February 20, 1892, three fresh outbreaks of this disease occurred in Great Britain. One of these was in London, one in York (West Riding), and one in Leith. The number of cattle affected with the disease slaughtered during the month was ten, while 150 healthy cattle exposed to the risk of infection were slaughtered, and also twenty-one cattle suspected of being affected, but which on post-mortem examination were found to be free from it.

ANTHRAX.—There have been twenty fresh outbreaks of anthrax reported in Great Britain in the past

four weeks. Forty-two animals were attacked, two diseased animals were killed, twenty-four died, and five recovered. These outbreaks of anthrax occurred in the counties of Devon, Essex, Huntingdon, London, Norfolk, Northampton, Notts, Somerset, Surrey, Sussex East, and York (W. R.) in England, and in Fife, Mid-lothian, Roxburgh, and Wigtown in Scotland.

SWINE FEVER.—This disease is less prevalent than it was a year ago. In the four weeks ended February 20th, there were only 129 fresh outbreaks reported, as compared with 212 in the corresponding period of 1891. There were 731 pigs attacked in the four weeks, 401 diseased pigs were killed, 269 died, 96 recovered, and 130 remained alive at the time the last published return was made up.

Mr. DENT desired to call attention to one matter in connection with the outbreak of foot-and-mouth disease. In the new Order from the Board of Agriculture, it was stated that "A Local Authority *may*, and when required by the Board of Agriculture *shall*, cause to be slaughtered" animals affected with foot-and-mouth disease, and also that "the local authority *shall* out of the local rate pay compensation" for animals so slaughtered. This was recurring to what had caused a great deal of dissatisfaction before in the case of pleuro-pneumonia, and the Council would remember that this question was discussed by them, especially in connection with Cumberland. Afterwards it was enacted that a sum of money voted by Parliament out of the general taxation of the country should be placed at the disposal of the Board of Agriculture in order to provide payment of compensation for compulsory slaughter. The present Order as to foot-and-mouth disease was a return to what he could not but call a vicious practice, viz., compelling a Local Authority to slaughter, but making it pay compensation out of the local rates.

Stock Prizes.

Mr. SANDAY (Chairman) reported an offer from the Hackney Horse Society of two gold medals for the best Hackney stallion and the best Hackney mare exhibited at the Warwick Meeting, and the Committee had recommended that this offer be accepted with thanks.

The first prize winner, No. 951, in Class 75 (Sussex cow or heifer in milk or in calf), Mr. J. Stewart Hodgson's "Peace 6th" having failed to comply with the regulations of the prize sheet as to calving, was therefore disqualified from receiving the prize. The following animals, having duly qualified, now succeeded to the prizes :—First prize of 15*l.* to William Stewart Forster for "Black Eyes" (*Second Prize*). Second prize of 10*l.* to Louis Huth for "Virgin 23rd" (*Third Prize*). Third prize of 5*l.* to William Stewart Forster for "Damsel (*Reserve Number*).

Judges' Selection.

Mr. SANDAY reported that with very few exceptions the gentlemen nominated at the last meeting to act as Judges at Warwick had accepted office, and that arrangements had been made for filling up vacancies.[1]

Implement.

Mr. FRANKISH (Chairman) reported that, owing to the severity of the weather, it had been found necessary to postpone the plough trials at Warwick until March 7 and following days.[2] Correspondence with the plough competitors was laid upon the table, and directions given thereon. The question of limitation of space to exhibitors at the Society's Meetings had been considered, and the Committee decided that in future Regulation 4 of the Implement prize sheet should read as follows :—

> No exhibitor will be allowed to take less than 10 ft. or more than 150 ft. of shedding in the Show-yard. If an exhibitor desires to take all his shedding in the machinery-in-motion department, the maximum space allowed will be 100 ft.

Two letters from Mr. Frank Proctor

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[1] For a list of the Judges appointed see pages xlvi. and xlvii.

[2] In consequence of the continued severity of the weather, it became necessary on March 4 to further postpone these trials, which eventually took place on March 21, 1892, and following days.

as to the exhibition of diggers at work during the time of the Warwick Meeting were read, and the Committee recommended that intending exhibitors of diggers be informed that they must take space in the ordinary way for the exhibition of their implements in the Warwick Showyard, and must themselves make all necessary arrangements for showing their implements at work on the field which the Society had undertaken to provide for the purpose. The Committee had considered an application for further trials of fruit evaporating machines, and recommended that no further trials should be undertaken by the Society this year; but that every facility be given to exhibitors of such machines. The Committee had further considered the question of the trials of implements for 1893, and recommended that prizes of 50*l.*, 30*l.*, and 20*l.* should be offered for the best self-binding harvester (using other binding material than wire).

General Warwick.

Mr. Dent reported that the following would be the charges for cabs and waggonettes betwcen the towns of Warwick and Leamington and the Showyard during the time of the Warwick Meeting:—From the Great Western Station, Warwick, to and from the Showyard—Cabs 9*d.* per passenger, with a minimum charge of 1*s.* 6*d.* Waggonettes, 6*d.* per passenger. From the Milverton, Avenue, and Great Western stations within the Borough of Leamington to and from the showyard—Cabs, 1*s.* per passenger, with a minimum charge of 2*s.* 6*d.*; waggonettes, 9*d.* per passenger. The Committee recommended that 15,000 copies of the combined catalogue be printed. The Local Committee had nominated Messrs. Thacker and Christmas, of Warwick, and Messrs. Burgess and Colborn, of Leamington, as additional agents for the sale of dairy produce.

Showyard Works.

Mr. Clay, in presenting this report, said the Council would regret with him that the Chairman of the Committee (Sir Jacob Wilson) was not able to attend, on account of ill-health, to present the report. They hoped that he would soon recover and take his place amongst them again. (Hear, hear.) Mr. Bennison had reported that the Showyard works at Warwick were commenced, and the yard partly enclosed with a high fence. The entrances and offices were nearly completed. The Local Committee had nearly finished the levelling of the ground, and the laying down of sleeper roads to the goods entrance. They were also laying on the water mains. The Committee had considered the various tenders received for refreshments, but had postponed any final recommendation until their next meeting.

Selection.

Earl Cathcart (Chairman) officially announced the death of Sir James Caird, an Honorary Member of the Society, and said that the time had long gone by of the Free Trade controversy, when Sir James Caird's political writings first appeared, and they remembered nothing but the great services he had rendered to his country. They were all agreed that day in remembering his loss with regret.

On the motion of Earl Cathcart, seconded by the Duke of Richmond and Gordon, Viscount Emlyn was unanimously elected a Vice-President of the Society, in the room of the late Duke of Devonshire, and a nomination was made for filling the vacancy thus caused on the Council.

Education.

Lord Moreton (Chairman) reported the issue of the third edition of the Society's Text-Book on Agriculture, and that the copies were selling satisfactorily. Certain of the insect diagrams had run out of print, and a reprint had been made of them. The following time-table for the Senior Examination, to be held from the 10th to the 14th May next, had been arranged:—

Tuesday, May 10th.
- Land Surveying . . . . 10 a.m. to 1 p.m.
- Agriculture (written paper) 2 p.m. to 5 p.m.

Wednesday, May 11th.
- Agricultural Engineering, 10 a.m. to 1 p.m.
- Agriculture (*vivâ voce*) . . 2 p.m. to 5 p.m.

Thursday, May 12th.
- Chemistry (General). . . 10 a.m. to 1 p.m.
- Chemistry (Agricultural) . 2 p.m. to 5 p.m.

Friday, May 13th.
Book-keeping . . . . . 10 a.m. to 1 p.m.
Botany. . . . . 2 p.m. to 4 p.m.
Agricultural Entomology . 4 p.m. to 6 p.m.
Saturday, May 14th.
Geology . . . . 10 a.m. to 1 p.m.
Anatomy . . . . 2 p.m. to 4 p.m.

Copies of the revised syllabus of the Society's examinations had, since the last meeting, been posted to all the head masters of provincial grammar schools.

Dairy.

The Hon. CECIL T. PARKER (Chairman) submitted copies of a revised edition of the "Simple Rules for Butter-making," and of a reprint of the pamphlet on "Cheddar Cheese-making," which had just been issued. Mr. Marshall Dugdale had undertaken to arrange for the translation into Welsh of the "Simple Rules for Buttermaking," with a view to the circulation of copies in the Principality. Various details in connection with the dairy at Warwick had been settled; and further consideration given to the prizes proposed to be offered for cheese at the Chester Meeting of 1893.

Society's Premium Stallions.

The Duke of RICHMOND and GORDON, as Chairman of the Thoroughbred Stallion Committee, reported that in District Class F at the London Spring Show the three premiums of 200*l.* each given by the Society, and the three gold medals offered by the Warwick Local Committee, had been awarded to Mr. E. G. Crowhurst's "Just-in-Time," Lord Tredegar's "Lord Molynoo," and Mr. J. C. Harford's "Ramcses."

Rotation of Districts for Country Meetings.

The Duke of RICHMOND and GORDON said that Sir Jacob Wilson, who was unfortunately absent through continued ill-health, had asked him to move the following motion which stood in Sir Jacob's name:—

> That a Special Committee be appointed to inquire into the working of the present rotation of districts for the Society's Country Meetings, and to report whether any modifications in the existing arrangements appear necessary or desirable.

There had been several Committees of this kind appointed in the past. In all, five Committees—viz. in 1841, 1845, 1861, 1867, and 1876—had inquired into this matter, and since 1876 the country had been divided into seven districts. With the Chester Meeting of 1893 they would have gone through the whole of these districts for the second time, and it seemed to Sir Jacob Wilson that the present was the proper time to consider whether any modification of the existing arrangement should take place. In moving this motion, he (the Duke) did not think that it should be taken as a certainty that the present arrangement would be upset. On the contrary, the Committee, having heard all the evidence, might be of opinion that the present system had worked very well. If the Committee should be of opinion that the system worked badly, they could take the opportunity of making any requisite alteration. The inquiry should take place soon, because in May next the Council would have to declare the district to be visited by the Society in the year 1894.

The Hon. CECIL T. PARKER seconded the motion, saying it might do good and could not do any harm.

The Earl of RAVENSWORTH was rather surprised when he had seen this motion on the agenda paper, and would like to ask his Grace whether from any authoritative source anything like serious objection had been taken to the present system of rotation. He (Lord Ravensworth) had never heard any complaints himself, and he rather agreed with what the noble Duke said that there was, apparently, no reason for any alteration. He conceived there might have been objections raised from some quarters. Did his Grace know?

The Duke of RICHMOND replied that he knew of no such objections. He imagined that the Committee would be appointed to inquire whether there were any objections to the present system.

Lord RAVENSWORTH then inquired the reason for the appointment of the Committee.

The PRESIDENT pointed out that

it appeared to be thought that it was hardly a good arrangement that they should have an agricultural county like Chester to compete with the great manufacturing districts of Lancashire. This was probably the reason in the mind of Sir Jacob Wilson and others for making this proposal. Of course the difficulty he had indicated might apply to other parts of the country.

Lord EGERTON OF TATTON said it was unfortunate that the two counties should have been put into antagonism, and he confessed he was very sorry the other day that it was so. He suggested whether North Wales should not be made a district by itself.

Mr. CHANDOS-POLE-GELL said that Sir Jacob had intended to bring forward this motion before the discussion arose in regard to Chester and Manchester, because Sir Jacob had spoken to him upon the subject.

The motion was then put and carried unanimously, and on the further motion of the Duke of RICHMOND, seconded by the Earl of LATHOM, the Committee was constituted as follows:—The President (ex-officio), Earl Cathcart, Viscount Bridport, and Mr. Dent (representing the Committee of 1867), Sir Nigel Kingscote, Sir Jacob Wilson, and Mr. Frankish (representing the Committee of 1876), the Hon. C. T. Parker, Sir John Thorold, Mr. Bowen-Jones, Mr. Clay, and Mr. Foster.

Railway Rates.

A letter from the Mansion House United Association on Railway Rates, stating that it was now established as a permanent organisation, and asking the Society to make an annual subscription to its funds, having been read by the SECRETARY,

Mr. FRANKISH said that agriculturists and traders generally, and a great many members of the Society who were in business, were much indebted to the Association for the work they had done last year in connection with the settlement of the railway rates. He thought it would be a very cheap means of getting information for their members if they supported the Association in the way proposed, by subscribing, say, 10*l.* annually.

Mr. CLAY seconded the proposition of Mr. Frankish, on the ground that the matter was of sufficient importance to warrant the Society giving a moral support to the Association by an annual subscription of 10*l.*

The Duke of RICHMOND and GORDON objected to the motion. In the first place the matter was entirely beyond the scope of the Society. They were now asked to subscribe to the Mansion House United Association, which dealt with all the railways throughout the country. He could find nothing in the Charter which could warrant their doing that. They were asked to subscribe to an association not dealing exclusively with agriculture, but dealing with traders of every description in all parts: manufacturers, coalowners, ironmasters, in fact with all persons who used the railways.

Sir MASSEY LOPES thought that the proposed subscription would create a very bad precedent.

The PRESIDENT could not agree with this view, and was in favour of the grant.

The Earl of RAVENSWORTH thought that the subscription should not be given.

On a division Mr. Frankish's motion was lost by twenty-one votes to twelve.

Date of next Meeting.

Authority having been given to affix the Society's seal to the agreement with the Corporation of Chester for the holding of the Country Meeting of 1893, the Council adjourned until Wednesday, April 6, at noon.

LIST OF JUDGES
APPOINTED TO ACT FOR THE
WARWICK MEETING, JUNE 18 TO 24, 1892.

IMPLEMENTS.

Ploughs.

MASON COOKE, The Lawns, near Ely.
HENRY GOODYEAR, Austerby, Bourne, Lincs.
WILLIAM NEWTON, Crowmarsh Battle, Wallingford.

Miscellaneous Implements.

T. H. THURSFIELD, Barrow, Broseley.
ROBERT WALLACE, Auchenbrain, by Mauchline, N.B.

HORSES.

Hunters.—*Classes* 2, 4, 5, *&* 6.

R. CHANDOS-POLE, Sydling Court, Dorchester.
P. ALBERT MUNTZ, M.P., Dunsmore, Rugby.

Hunters.—*Classes* 1, 3, 7, *&* 8.

M. ANGUS, Cattleholmes, Hull.
R. T. BASSETT, Crossways, Cowbridge.

Coach Horses, and Harness Horses and Ponies.—*Classes* 9, 10, 21, *&* 22.

A. E. PEASE, M.P., Pinchinthorpe, Guisborough.
C. B. E. Wright, Bolton Hall, Clitheroe.

Hackneys and Ponies.—*Classes* 11–20.

T. ROBSON, Wold House, Driffield.
JOHN ROWELL, Manor Farm, Bury, Hunts.

Shire and Agricultural.
Classes 23–29; 40 *&* 41.

THOMAS B. FRESHNEY, South Somercotes, Louth.
GARRETT TAYLOR, Trowse House, Norwich.

Clydesdales.—*Classes* 30–34.

ADAM GRAY, jun., Ingleston of Borgue, Kirkcudbright.
JAMES PICKEN, Langside, Craigie, N.B.

Suffolks.—*Classes* 35–39.

B. WADE COOPER, 3, Guildhall St., Bury St. Edmunds.
R. H. WRINCH, Harkstead, Ipswich.

CATTLE.

Shorthorn.—*Classes* 42–48.

G. ASHBURNER, Low Hall, Kirkby-in-Furness.
C. W. TINDALL, Scawby, Brigg.

Hereford.—*Classes* 49–55.

J. P. TERRY, Berry Field, Aylesbury.
W. THOMAS, The Hayes, Sully, Penarth.

Devon.—*Classes* 56–61.

SAMUEL KIDNER, Bickley, Milverton.
WILLIAM TAIT, Shaw Farm, Windsor.

Sussex.—*Classes* 62–67.

P. GORRINGE, jun., Pebsham, Bexhill.
A. HEASMAN, Court Wick, Littlehampton.

Longhorn and Welsh.—*Classes* 68–74.

C. F. PRIESTLEY, Hirdrefaig, Llangefni, Anglesey.
N. STILGOE, The Green, Adderbury, Banbury.

Red Polled.—*Classes* 75–80.

E. W. BECK, Norwich.
G. GOODERHAM, Monewden, Wickham Market.

Jersey.—*Classes* 81–86.

Col. C. P. LE CORNU, La Hague Manor, Jersey.
HUGH C. SMITH, Mount Clare, Roehampton.

Guernsey.—*Classes* 87–91.

Hon. & Rev. A. C. BAILLIE-HAMILTON, Combs, Stowmarket.
A. DUNLOP, Church Farm, Hendon, Middlesex.

Kerry and Dexter Kerry.
Classes 92–95.

LUKE CHRISTY, Carrigeen, Croom, Limerick.

SHEEP.

Leicester.—*Classes* 98–101.

ROBERT FISHER, Leconfield, Beverley.
BENJAMIN PAINTER, Burley-on-the-Hill, Oakham.

Cotswold.—*Classes* 102–105.

THOMAS BROWN, Marham Hall, Downham Market.

ROBERT JACOBS, Signett Hill, Burford, Oxon.

Lincoln.—*Classes* 106–109.

CHARLES CLARKE, Ashby-de-la-Launde, Lincolnshire.

H. MACKINDER, Langton Grange, Spilsby.

Oxford Down.—*Classes* 110–113.

J. BRYAN, jun., Southleigh, Witney.

A. F. MILTON DRUCE, Fyfield, Abingdon.

Shropshire. (Rams.)
Classes 114 & 115.

THOMAS A. BUTTAR, Corston, Coupar Angus, N.B.

CHARLES COXON, Elford Park, Tamworth.

Shropshire. (Ram Lambs and Ewes).
Classes 116–119.

A. E. MANSELL, Harrington Hall, Snifnal.

RICHARD THOMAS, The Buildings, Baschurch.

Southdown.—*Classes* 120–123.

J. A. HEMPSON, Erwarton Hall, Ipswich.

HUGH PENFOLD, Selsey, Chichester.

Hampshire Down.—*Classes* 124–127.

JAMES FLOWER, Chilmark, Salisbury.

GEORGE JUDD, Cocum, Micheldever.

Suffolk.—*Classes* 128–131.

WILLIAM HARVEY, Timworth, Bury St. Edmunds.

S. W. SLATER, Cheveley Hall, Newmarket.

Border Leicester.—*Classes* 132–134.

JOHN DAVISON, Tritlington Hall, Morpeth.

JOHN HUNTER, Dipple, Fochabers, N.B.

Clun Forest and Welsh Mountain.
Classes 135–138.

THOMAS JONES, Talybont R.S.O., Brecon.

EVAN THOMAS, Caewynnick Lodge, Builth.

GOATS.
Classes 139–143.

C. L. JACKSON, Hillfold, Bolton.

J. S. RAWSON, Hough End, Sowerby Bridge.

PIGS.

White.—*Classes* 144–155.

Capt. HEATON, Worsley, near Manchester.

Capt. BESWICK ROYDS, Pyke House, Littleborough.

Berkshire and Black.
Classes 156–163.

THOMAS HARRIS, Cublington, Leighton Buzzard.

HEBER HUMFREY, Shippon, Abingdon.

Tamworth.—*Classes* 164–167.

G. MANDER ALLENDER, 7 Albemarle Street, W.

THOMAS HARRIS, Cublington, Leighton Buzzard.

POULTRY.
Classes 168–265.

FRANK BENISON, 68 Regent Street, Leamington.

EDWARD BROWN, 16 Woodberry Grove, London, N.

R. FLETCHER HOUSMAN, Regent Street, Lancaster.

M. LENO, Cox Pond Farm, Hemel Hempstead.

J. W. LUDLOW, Vauxhall Road, Birmingham.

PRODUCE.

Cheese.—*Classes* 266–270.

GEORGE LEWIS, Ercall Park, Wellington, Salop.

P. W. STONE, 105 Victoria Street, Westminster, S.W.

Butter.—*Classes* 271–273.

THOMAS CLEMENCE, 10 Northgate Street, Chester.

JOHN VALENTINE, Broad Street, Ludlow.

Cider and Perry.—*Classes* 274–277.

B. GOODALL, Tenbury, Worcestershire.

Jams and Fruits.—*Classes* 278–281.

J. WOOD, Crocken Hill, Swanley, Kent.

Hives and Honey.—*Classes* 282–297.
[Not yet appointed.]

COMPETITIONS.

Farms.

J. B. ELLIS, West Barsham, Walsingham.

J. P. TERRY, Berry Field, Aylesbury.

Butter-making.

D. A. GILCHRIST, University College, Bangor.

HARRY J. HILDYARD, Barkstone, Grantham.

Horse-shoeing.

GEORGE HOLTHAM, Gloucester.

F. T. STANLEY, Montague Street, Stones End, Borough, S.E.

PRINCIPAL ADDITIONS TO THE LIBRARY DURING THE YEAR 1891.

[*The name of the Donor, or the mode of acquisition, appears in italics after the title of each work.*]

BARRAL, J. A., Dictionnaire d'Agriculture. Fasc. 24, 25. 8vo. Paris, 1891. *Purchased*

Bingley, Rev. W., Memoirs of British Quadrupeds. 8vo. London, 1809. *Purchased*

Boitel, A., Agriculture Générale. 8vo. Paris, 1891 ....*Author*

Boizard, E., et Tardieu, H., Histoire de la Législation des Sucres. 8vo. Paris, 1891..*Publishers*

Borne, Max von dem, Die Fischzucht. Sm. 8vo. Berlin, 1885.......*Purchased*

Broderick, the Hon. G. C., English Land and English Landlords. 8vo. London, 1881 ....*Purchased*

Brown, Edward, Poultry Keeping as an Industry for Farmers and Cottagers. 4to. London, 1891..*Author*

Buerstenbinder, Dr. R., Urbarmachung und Verbesserung des Bodens. Sm. 8vo. Berlin, 1886..*Purchased*

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GOODERHAM, Monewden, Wick-...m Market.
Jersey.—*Classes* 81–86.
C. P. LE CORNU, La Hague Manor, Jersey.
...H C. SMITH, Mount Clare, Roe-...mpton.
Guernsey.—*Classes* 87–91.
Rev. A. C. BAILLIE-HAMILTON, ...os, Stowmarket.
...LOP, Church Farm, Hendon, ...esex.
...rry and Dexter Kerry.
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The Society is indebted to numerous Government Departments, both at home and abroad, to Boards of Agriculture, Agricultural Societies, and kindred institutions, for copies of their Annual Reports, Journals, Proceedings, Transactions, Bulletins, and other documents received regularly for the Library, in exchange for copies of the Journal, as well as to the Editors of many agricultural and general papers for the current numbers of their publications, which have been placed in the Reading Room for reference.

ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

Proceedings of the Council.

WEDNESDAY, APRIL 6, 1892.

THE EARL OF FEVERSHAM (PRESIDENT) IN THE CHAIR.

Present:—

Trustees.—Earl Cathcart, Lord Egerton of Tatton, Colonel Sir Nigel Kingscote, K.C.B., Sir A. K. Macdonald, Bart., Sir M. W. Ridley, Bart., M.P.

Vice-Presidents.—Mr. H. Chandos-Pole-Gell, Mr. Walter Gilbey, Earl of Lathom, Lord Moreton, Sir J. H. Thorold, Bart.

Other Members of Council.—Mr. G. M. Allender, Mr. J. Bowen-Jones, Mr. Charles Clay, Earl of Coventry, Mr. Percy E. Crutchley, Mr. Alfred Darby, Mr. J. Marshall Dugdale, Mr. William Frankish, Mr. Anthony Hamond, Mr. James Hornsby, Mr. Charles Howard, Mr. C. S. Mainwaring, Mr. Joseph Martin, Mr. T. H. Miller, Mr. Dan. Pidgeon, Mr. J. E. Ransome, Mr. S. Rowlandson, Mr. G. H. Sanday, Mr. A. J. Smith, Mr. Henry Smith, Sir J. L. E. Spearman, Bart., Marquis of Stafford, Mr. E. W. Stanyforth, Mr. Martin J. Sutton, Mr. Garrett Taylor, Mr. Joseph P. Terry, Mr. John Tremayne, Mr. R. A. Warren, Mr. E. V. V. Wheeler, Mr. C. W. Wilson, Sir Jacob Wilson.

Officers.—Mr. Ernest Clarke, Secretary and Editor; Dr. J. Augustus Voelcker, Consulting Chemist; Mr. Wilson Bennison, Surveyor.

Mr. A. C. Cope, of the Board of Agriculture.

The following members of the Warwick Local Committee were also present:—The Mayor of Warwick (Mr. J. W. Mann), the Mayor of Leamington (Mr. John D. Barbour), the Town Clerk of Warwick (Mr. Brabazon Campbell), Mr. J. W. Margetts, and Mr. Frederick H. Moore (Secretary of the Local Committee).

Apologies for Non-attendance.

Apologies for non-attendance were received from H.R.H. Prince Christian, K.G., the Duke of Richmond and Gordon, K.G.; the Earl of Ravensworth, General Viscount Bridport, G.C.B., Hon. Cecil T. Parker, Mr. Ashworth, Mr. James A. Caird, Lieut.-Col. J. F. Curtis-Hayward, Professor Simonds, and Mr. Whitehead.

The late Duke of Clarence.

The minutes of the last meeting of Council held on March 2 having been approved, a letter was read from the Home Secretary stating that the Address to Her Majesty the Queen of the President and Council of the Society, on the occasion of the death of His Royal Highness the Duke of Clarence and Avondale, had been laid before Her Majesty, who had been pleased to receive the Address very graciously. This letter (for the text of which see page xxxv.) was ordered to be entered upon the minutes.

Election of H.R.H. Prince George of Wales as a Governor.

The PRESIDENT said it afforded him great pleasure to propose that

H.R.H. Prince George of Wales should be elected a Governor of the Society. His illustrious father, H.R.H. the Prince of Wales, had consented to nominate Prince George, and he (the President) was sure it would give every member of the Society the same keen satisfaction which it afforded him to find that another and so distinguished a member of the Royal Family had become a member of the Society. He was confident they would all rejoice that H.R.H. Prince George would follow in the footsteps of the other members of his illustrious House, who had ever shown the deepest interest in, and had done all in their power to promote, the great cause of British agriculture. (Cheers.)

Election of New Governors and Members.

The election of the following two Governors and eighty-six Members was then proceeded with:—

Governors.

H.R.H. Prince George of Wales, K.G...Marlborough House, S.W.
Holford, Captain G. L., C.I.E...Westonbirt, Tetbury.

Members.

Alcock, John..Pulford, Wrexham.
Alexander, Major J...Milford, co. Carlow.
Allison, J. A...Belmont House, Guisboro'.
Bale, J...Shotwicke Lodge, Chester.
Barnard, W...Bolton Percy, Leeds.
Beach, A. E...Toddington, Winchcomb.
Beard, G...Thickthorn, Kenilworth.
Blackwell, S. F...Bichmarsh Hall, Warwicks.
Booth, Miss A. Gore..Lipadell, Sligo.
Booth, M...Hampton, Salop.
Caird, R. H...Southbroom Ho., Devizes.
Cardwell, T. H...Newnton Ho., Tetbury.
Cheape, Mrs. M. M...Bentley Manor, Redditch.
Chew, W. L...Pell Wall, Market Drayton.
Chichester, R. H...Drewsteignton Rectory, Devon.
Child, C...Bromley Palace, Kent.
Children, R...Hawden Farm, Tunbridge.
Christie, A. L...Tapeley Park, Bideford.
[1] Coldicott, R...Shipston-on-Stour, Worces.
Cradock, G...Denby Dale Rd., Wakefield.
Crowhurst, E. G.. Chesham Ho., Leamington.
Deane, H...Clay Hill House, Gillingham.
Dyott, G. R...Freeford Hall, Lichfield.
Egerton, Sir P. H. B. Grey, Bt...Oulton Park, Tarporley.
Everitt, G. A...Knowle Hall, Warwickshire.
Fair, J. H...Aldford, Chester.
Fairfax, G. T...Bilborough Hall, Yorkshire.
Faul, A. T...Tresawle, Probus.
[1] Fenton, J...6, Cecil Street, Lytham.
Fowler, Sir T., Bt...Gastard Ho., Corsham.
France, G. H. H. Hayhurst..Ystym Colwyn, Mont.

[1] Reinstated under Bye-law 12.

Francis, J...Myrtle Hill, Carmarthen.
Freckleton, W. T...Ravenstone, Ashby-de-la-Zouch.
Gloyne, W. F...Lambourn, Berks.
Green, J. T...Hunton Bridge, King's Langley.
Hart, J...Mains of Cowie, Stonehaven, N.B.
Heathcote, Rev. W. A...Beaumont College, Old Windsor.
Hockenhull, G. C...Kiln Green, Whitchurch, Salop.
Hoole, Col. W. W...Chavenage, Tetbury.
Hurrell, W. A...Southminster, Essex.
Hutton, E. E...Grove Park, Warwick.
Jones, Col. F. T...Chippenham, Wilts.
Jones, Col. R. Inigo..Kelston Park, Bath.
Juckes, T. G...Tern, Wellington, Salop.
Kay, H...Wood Farm, Marple, Cheshire.
Lambert, W...Horsmonden, Kent.
Lee, A. V. H. V...Dillington Park, Ilminster.
Lucking, A...100 High Street, Maldon.
Manfield, W. J...Ixworth Thorpe, Bury St. Edmunds.
Manwaring, G...The Brook, Marden, Kent.
Mark, J...St. Ann's Square, Manchester.
Marsh, E. J...1 Bridge Street, Stafford.
Marshall, W...7 Albemarle Street, W.
Mason, H...Sherburn Farm, Upton, Gainsborough.
Maughan, G...Wootton Park, Henley-in-Arden.
Moon, C...Chessington Court, Surbiton.
Moore, J. G. D...Trewithen, Probus.
Mountfort, J...Drayton Basset, Tamworth.
Nott, A. R...The Birch Farm, Kinlet, Bewdley.
Onslow, Sir W. W. R., Bt...Hengar, Bodmin.
Palk, Hon. E. A...Twatley, Malmesbury.
Phillips, H. E...21 Chesham Place, S.W.
Plumptre, G. B...Wootton Court, Warwick.
Ramsay, Hon. C. M...Brechin Castle, N.B.
Rees, J. S...Gelly Ho., Llanelly.
Roberts, H. W...Hollingside, Durham.
Robins, J. Y...West Hill, Leamington.
Rush, H...Hectorage, Tunbridge.
Scarlett, W. J. Y...Ripley, Yorks.
Simpson, G. B...Knutsford.
Smith, J. L...Corringham Grange, Gainsborough.
Smith, W. R...Greatham Moor, West Liss.
Sumner, F. G...Myton Ho., Warwick.
Tangye, A. C...Wyre Forest, Salop.
Teasdale, R...Bank Top, Darlington.
Tompson, J. J...Baddesley, Ensor, Atherstone.
Tresawna, H...Lamellyn, Probus.
Twentyman, J...Hawkrigg House, Wigton.
Vickers, T. R...Hollyberry Hall, Allesley, Coventry.
Ward, Rev. R. C...Dereham Ho., Leamington.
Wellingham, C. H...Soignies Farm, West-acre, Swaffham.
West, W...Barcote Manor, Faringdon.
Williams, F...Watchbury, Barford, Warwick.
Woods, A...Tilney St. Lawrence, Lynn.
Wright, N...Soppin Castle, Heads Nook, Carlisle.
Yorath, W. H...Park Chambers, Cardiff.

Rotation of Districts for Country Meetings.

Sir Jacob Wilson asked leave to intervene at this stage, to bring up the report of the special Committee as to the rotation of the districts for the Society's country meetings. The Committee, which, as they might re-

member, had been appointed last month at his suggestion, had done him the honour of electing him Chairman, and had already had two sittings, one on Monday last and the other that morning. As they had agreed upon their report, they had decided to present it that day. (For text of report see page 363.) He regretted that he had been unable to be present at the last meeting, as he might possibly have removed the anxieties and doubts expressed by his noble friend Lord Ravensworth and others as to some revolutionary intention of his in upsetting the present rotation of districts. Nothing had been further from his thoughts. In fact, he believed the districts into which the Society had divided the country had worked very satisfactorily. His feeling in the matter was that, inasmuch as after the Chester Meeting of 1893 the Society would have finished the second rotation of the districts in their present form, it was only following a precedent which had been set on as many as five previous occasions to appoint a Committee to consider the situation and determine whether they should go on as before, or, if any alteration was thought desirable, to indicate what that alteration should be. The Committee had now sat and had agreed upon the report just read. He might say at once that the unanimous opinion of the Committee was that the districts as at present constituted did not require alteration. All that they now proposed was to give territorial importance to a few of the largest and most populous towns in the country, and therefore they selected towns like Birmingham, Liverpool, and Manchester to come into the rotation every third or fourth year. They would thereby have a reasonable prospect of replenishing their coffers once in three years at any rate, whilst giving a better chance for ordinary towns in the districts to send invitations with some probability of success, without bringing the more important and populous towns into competition.

Earl CATHCART, as a surviving member of the Committee upon the same subject appointed in 1867, wished to be allowed to second the report, chiefly in order to express the general feeling of satisfaction that Sir Jacob Wilson was amongst them again. (Cheers.)

After a short discussion, the report was formally adopted.

The reports of the several Standing Committees were next presented and adopted as below:—

Finance.

Sir NIGEL KINGSCOTE (Chairman) reported that the accounts for the month ended March 31, 1892, as certified by the Society's accountants, showed total receipts amounting to 3,229*l.* 17*s.* 4*d.*, and expenditure 1,595*l.* 12*s.* 11*d.* The balance at the bankers' on March 31, allowing for cheques outstanding, was 8,302*l.* 0*s.* 11*d.* Accounts amounting in all to 4,596*l.* 3*s.* 10*d.* had been passed, and were recommended for payment. The quarterly statement of arrears and property as at March 31, 1892, was laid upon the table.

House.

Sir NIGEL KINGSCOTE (Chairman) presented the report of this Committee, which dealt with various matters connected with the Society's house.

Journal.

Earl CATHCART (Chairman) reported that Vol. III., Part I., of the Journal had been published on March 31, and the copies were in course of distribution to the members. The Committee recommended for payment various accounts for printing and literary contributions in respect of this number. The arrangements for the next number of the Journal had been discussed, and directions given thereon.

Earl CATHCART, in presenting this report, made sympathetic allusion to the death of the Society's publisher, Mr. John Murray, and referred to the fact that Mr. Murray had been associated with the Society from its very beginning, and had arranged with Mr. Philip Pusey fifty-three years ago the terms upon which their Journal was originally published. In answer to a letter of sympathy by their Secretary, Mr. Murray's son and successor had written a very cordial note of thanks, in which he echoed

the hope that the old association between Albemarle Street and the Royal Agricultural Society might long continue in the same spirit in which it had hitherto always existed. Continuity was everything in matters of this kind, and the very agreeable reply of "John Murray the Fourth"—a worthy successor to his excellent father—gave promise of the continuance of the amicable relations which had for so long existed between the Society and its publisher.

Chemical.

Mr. WARREN stated that the report of the Woburn Sub-Committee had been received and adopted. A letter had been read from the Departmental Committee of the Board of Agriculture on the adulteration of fertilisers and feeding stuffs, asking the Council to appoint a representative of the Chemical Committee to give evidence before the Committee. After careful consideration of this request, the Committee thought that it would be sufficient if Dr. Voelcker, who they understood had been already summoned as a witness, handed in a memorandum of the action taken by the Society in this matter since the adoption of Lord Lichfield's motion of 1869.

Seeds and Plant Diseases.

Sir JOHN THOROLD reported that copies were ready of Mr. Carruthers' pamphlet explanatory of the set of the eight diagrams of the wheat plant, after Francis Bauer, prepared by the Society. As already arranged, one copy of this pamphlet would be included with each set of the diagrams sold; but it was proposed that extra copies of the pamphlet for the use of scholars should be issued at the price of 3*d*. each. The Committee had made arrangements for the experiments with *bouillie bordelaise* as a remedy against the potato disease to be carried out this season, and they had selected the farms in the districts appointed at the last meeting, upon which the experiments should be made. The question had been considered as to whether the experiments should be confined to the *bouillie bordelaise* mixture as used last year, or whether they should include the modifications introduced by the addition of molasses, and it had been decided to adhere to the plan as settled at the last meeting.

Veterinary.

Sir JOHN THOROLD (Chairman) reported that as difficulties appeared to have arisen in some of the counties in dealing with the outbreak of foot-and-mouth disease, owing to doubts as to whether the powers of the County Council Committees under the Contagious Diseases (Animals) Acts ceased upon the dissolution of the Councils at the expiration of their term of office, or whether such powers continued until the reappointment of the Committees after the election of the new Councils, the Committee recommended, in order to obtain an authoritative pronouncement upon the point, that a letter be addressed to the President of the Local Government Board, asking whether it was a fact that the powers of the County Council Committees so ceased, or whether they remained in force until the new Committees were appointed. [For the Board's reply, see page lxii.] A letter had been read from Mr. Henry Tollemache, M.P., suggesting that the Society should issue some short instructions as to the best and speediest way of curing animals affected with foot-and-mouth disease, but the Committee recommended that Mr. Tollemache be informed that the Society could not take the responsibility of publishing any particular course of treatment. The Committee recommended that Mr. Thomas Horton, of 20 Jury Street, Warwick, be appointed the Society's Provincial Veterinary Surgeon for the county of Warwick in the room of the late Mr. O. Hills.

The following report had been presented by Professor Brown:—

FOOT-AND-MOUTH DISEASE.—The report which was presented at the last meeting of the Committee on March 1 gave a history of foot-and-mouth disease since the re-introduction on February 4. It was stated in the report that the disease had suddenly appeared in Edinburgh on February 27. Since that time seven outbreaks have occurred in the city of Edinburgh

and Midlothian, and one in the town of Leith. On March 4 the disease suddenly appeared in the slaughter-houses attached to the Glasgow Cattle Market, from which place it was conveyed by some animals to Paisley, where the disease was detected on the 7th. On March 14 it suddenly appeared at Dunning, in Perthshire, in which district it has extended to the neighbouring premises, and at the present moment there are a large number of diseased animals still alive in that country. Severe restrictions were placed on the movement of animals out of the districts where the disease had occurred in Scotland, and also into the adjoining counties, and at the present time the disease is only known to exist at the places already referred to in Perthshire and in the neighbourhood of Penicuick, in Midlothian. At the present time the restrictions imposed by the Board of Agriculture have been entirely removed from all the districts in Scotland with the exception of Midlothian, Perthshire, and the city of Glasgow. From Glasgow the disease was conveyed by cattle on March 3 to Settle in the West Riding of Yorkshire and Kirkby Lonsdale in Westmoreland, where it was detected on March 9. No extension of the disease having occurred in either of these districts, the Board of Agriculture have withdrawn the restrictions which were imposed at the time when the disease was first detected. On March 16 an outbreak was reported at Plemondstall, in Cheshire, and since that time others have occurred at Knutsford, Greesby, and Arrow, in the same county. One outbreak was reported on the 28th in a cowshed at Withington, near Manchester. Extensions of the disease have also occurred in the counties of Kent and Sussex, and two outbreaks were detected in cowsheds near Edgware Road, in London, and another at Brentford, and at Chigwell Row and Clavering, in Essex. At the time of writing this report, the only centres of foot-and-mouth disease which are known to exist are in the following districts: In Perthshire and Midlothian, in Scotland; in the neighbourhood of Manchester, in Lancashire; on three premises in Cheshire; on two in the county of Essex; one in London; at certain farms at Sittingbourne, in Kent; and in the neighbourhood of Cuckfield and Patcham, near Brighton, in Sussex. The districts which are now placed under restrictions for this disease are Perthshire, Midlothian, and Glasgow, in Scotland, part of Lancashire, the county of Cheshire, the Metropolitan Police District, and parts of the County of Essex, and the counties of Kent and Sussex, in England.

Pleuro-pneumonia.— There have been five fresh outbreaks of this disease in Great Britain in the five weeks ended March 26; four of these were within the Metropolitan Police District, and one in Leith. The number of cattle slaughtered by order of the Board of Agriculture was twenty-three diseased, 187 healthy ones exposed to infection, and seventeen suspected, but found, on post-mortem, to be free from pleuro-pneumonia.

Swine Fever.—The returns for this disease have for some time, and still are, much below the average for the corresponding period of the past four or five years. During the five weeks above mentioned there have been only 162 fresh outbreaks; 979 pigs were attacked, 536 diseased swine were killed, 339 died, seventy recovered, and 134 remained alive when the last published weeks' returns were made up.

Anthrax.—Twenty-three fresh outbreaks of this disease have been reported; thirty-nine animals were attacked; five of the diseased animals were killed; three recovered; the others died.

Stock Prizes.

Mr. Sanday (Chairman) reported that a letter had been received from the Secretary of the British Goat Society asking that a reduction in the fees payable by non-members for the entries of goats at the Warwick Meeting might be made, but the Committee could not recommend any alteration in the regulations. The

preliminary consideration of the prize-sheet for the Chester Meeting of 1893 had been postponed until the meeting of the Committee on Tuesday, May 31 next. The Committee were of opinion that the 600*l.*, which had been annually voted to the Royal Commission on Horse Breeding, should now be discontinued, and had unanimously resolved to request their Chairman to give notice on their behalf of a motion for a grant of 5,000*l.* for prizes for live stock, poultry, and produce at the Chester Meeting of 1893.

Sir JACOB WILSON inquired whether the Stock Prizes Committee desired to take the opinion of the Council that day upon the suggested discontinuance of the grant for thoroughbred stallions, or whether it was only desired to give notice of a motion on the subject.

Mr. SANDAY explained that he had been requested as Chairman of the Committee to give notice of his intention to move that the grant of 600*l.* should in future be discontinued. The Committee had expressed their opinion on the subject in their report, but they did not expect that the Council would come to a decision in the matter until the settlement of the amount to be granted for prizes at next year's Meeting.

Sir JACOB WILSON appealed to Mr. Sanday to postpone his motion for another month, in order to give the Royal Commission on Horse Breeding an opportunity of ascertaining what Her Majesty's Government would do. However anxious the Society might be to save its money, or to spend it in a manner more agreeable to itself, he did not think the Council wished to see the present system upset. It was utterly impossible for the Royal Commission to get information before May as to what the Government intended to do in the matter.

Mr. SANDAY replied that everything hinged upon the question as to whether these premiums should be discontinued; because if they were not, the Stock Prizes Committee could not ask the Council for so large a sum as 5,000*l.* to be given in prizes. He was pledged to give notice that day of his intention to ask for a grant of 5,000*l.* at the next meeting of the Council. He thought it was desirable that the other matter should be settled at the same time.

The subject then dropped, and the report of the Committee was adopted.

Judges' Selection.

Mr. SANDAY formally reported that the list of Judges for the Warwick Meeting had been finally settled. (For list, see page xlvi.)

Implement.

Mr. FRANKISH (Chairman) reported that the trials of ploughs at Warwick had been duly carried out from the 21st to 26th ult., and laid upon the table the official awards of the Judges. Letters had been read from two of the competitors with reference to these trials, but the Committee had approved the action of the Steward and Judges. Upwards of 12,000 feet of space had been applied for in the Implement Department of the Warwick Meeting. Correspondence respecting various entries had been laid before the Committee, and directions given thereon. The Committee had considered the regulations for the trials of sheaf binders to be held in connection with the Chester Meeting of 1893, and they recommended that a copy of the regulations as settled by them be forwarded to each member of Council before the next meeting, when a formal motion for their adoption would be made.

General Warwick.

Mr. CHANDOS-POLE-GELL reported that arrangements would be made with the St. John Ambulance Association for the establishment of an ambulance station on the same terms as last year. The Committee recommended that the usual application be made to the Home Secretary for the services of a detachment of a division of the Metropolitan Police. The Local Committee had arranged with a local Bath chairman for the supply of ten Bath chairs for use in the Showyard, the rate of charge to be 2*s.* per hour.

Showyard Works.

Mr. CLAY reported that the Showyard at Warwick was enclosed with a boarded fence, and that the en-

trances and pavilions were nearly completed; that 5,500 feet of shedding were built; and that the grand stand, dairy, and refreshment rooms were well in hand. The Local Committee were laying the water mains, and had nearly completed the levelling of the yard. The Committee had settled the tenders for the supply of refreshments at Warwick.

Selection.

Earl CATHCART (Chairman), in moving that the Duke of Westminster, K.G., nominated at the last meeting, be elected a member of the Council, in the room of Viscount Emlyn, appointed a Vice-President, said that a cordial letter of acceptance had been received from his Grace in reply to the invitation sent to him by the Council.

Mr. BOWEN-JONES had much pleasure in seconding the election of his Grace. The Duke of Westminster was a great territorial magnate in the neighbourhood of North Wales, and his selection as a member of the Council would be a matter of satisfaction to all the members in the Principality and in those important agricultural counties adjacent thereto.

Education.

Lord MORETON (Chairman) presented a report from the Text-book Sub-committee as to further issues of the Society's Text-book on Agriculture, and reported that arrangements had been completed for the translation of the book into German, and its publication in Berlin by the celebrated publisher of agricultural works, Herr Paul Parey. Twenty-eight entries had been made for the senior examinations to be held next month—the largest number of candidates yet reached.

Dairy.

Mr. DARBY reported that the settlement of a schedule of prizes for cheese at the Chester Meeting of 1893 had been postponed, pending the proposals of the Local Committee in regard to prizes for Cheshire cheese. Directions were given for the reprint of the Society's pamphlet on Cheshire cheese, the first edition of which had been sold out. Copies were laid upon the table of a Welsh edition of the simple rules for butter-making.

A further letter had been received from the English Jersey Cattle Society upon the subject of butter tests by the churn.

Retiring Members of Council.

The following list was prepared of the Members of Council who retire by rotation, showing the number of attendances at Council and Committee Meetings of each of such Members during the past two years, in accordance with Bye-law No. 23:—

Attendances at Meetings of Council and Committees from April, 1890, to March, 1892, inclusive.	Council Meetings. Total number, 19	Committees	
		No. of Meetings	Attendances
ARKWRIGHT, J. H. . . .	8	102	45
BEACH, Joseph (elected May 22, 1890) . . .	13	21	7
BEDFORD, Duke of (elected July 29, 1891)	—	4	—
BROUGHAM AND VAUX, Lord (elected May 22, 1890)	9	17	5
CLAY, Charles	13	51	36
CURTIS-HAYWARD, Lt.-Col. J. F. (elected May 6, 1891) . . .	7	4	4
FOSTER, S. P.	8	61	21
FRANKISH, William . .	17	119	107
GRENVILLE, R. Neville.	8	50	10
HORNSBY, James . . .	11	53	32
MUNTZ, P. Albert, M.P.	7	26	11
PIDGEON, Daniel . . .	14	55	34
PORTLAND, Duke of . .	4	—	—
RANSOME, James E. . .	10	35	21
RAWLENCE, James . .	7	—	—
SANDAY, George Henry	17	102	86
SMITH, Henry	15	42	21
SPEARMAN, Sir J., Bart.	11	42	25
STAFFORD, Marquis of	9	—	—
STRATTON, Richard . .	5	77	14
SUTTON, Martin J. . .	13	50	35
TREMAYNE, John . .	12	53	21
WARREN, R. A. . . .	15	45	32
WESTMINSTER, Duke of, K.G. (elected April 6, 1892)	—	—	—
WHEELER, E. V. V. . .	14	63	40

Miscellaneous.

The SECRETARY reported the execution of the agreement with the Corporation of Chester as to the Country Meeting of 1893, and laid various letters and other documents upon the table.

The Council then adjourned until Wednesday, May 4, 1892, at noon, and it was arranged that the meeting on Wednesday, June 1 (Derby Day), should be held at 10.30 A.M.

WEDNESDAY, MAY 4, 1892.

THE EARL OF FEVERSHAM (PRESIDENT) IN THE CHAIR.

Present.

H.R.H. the Prince of Wales, K.G. (Trustee); H.R.H. Prince George of Wales, K.G. (Governor).

Trustees.—Earl Cathcart, Mr. John Dent Dent, Col. Sir Nigel Kingscote, K.C.B., Sir A. K. Macdonald, Bart., Sir M. W. Ridley, Bart., M.P.

Vice-Presidents.—Mr. H. Chandos-Pole-Gell, Mr. Walter Gilbey, Sir Massey Lopes, Bart., Lord Moreton, Earl Spencer, K.G., Sir J. H. Thorold, Bart., Mr. Charles Whitehead.

Other Members of Council.—Mr. G. M. Allender, Mr. J. H. Arkwright, Mr. Joseph Beach, Mr. J. Bowen-Jones, Lord Brougham and Vaux, Mr. Charles Clay, Earl of Coventry, Mr. Percy E. Crutchley, Lieut.-Col. J. F. Curtis-Hayward, Mr. Alfred Darby, Mr. J. Marshall Dugdale, Mr. Hugh Gorringe, Mr. R. Neville Grenville, Mr. Anthony Hamond, Mr. James Hornsby, Mr. C. S. Mainwaring, Mr. Joseph Martin, Mr. T. H. Miller, Mr. P. A. Muntz, M.P., Hon. Cecil T. Parker, Mr. Albert Pell, Mr. J. E. Ransome, Mr. James Rawlence, Mr. G. H. Sanday, Mr. W. T. Scarth, Mr. A. J. Smith, Mr. Henry Smith, Sir J. L. E. Spearman, Bart., Marquis of Stafford, Mr. E. W. Stanyforth, Mr. R. Stratton, Mr. Martin J. Sutton, Mr. Garrett Taylor, Mr. Joseph P. Terry, Mr. R. A. Warren, Duke of Westminster, K.G., Mr. C. W. Wilson.

Officers.—Mr. Ernest Clarke, Secretary and Editor; Dr. J. Augustus Voelcker, Consulting Chemist; Professor J. B. Simonds, Consulting Veterinary Surgeon; Mr. Wilson Bennison, Surveyor.

Professor Brown, C.B.

The following members of the Warwick Local Committee were also present:—Lord E. J. Seymour, the Mayor of Warwick (Mr. J. W. Mann), the Mayor of Leamington (Mr. John D. Barbour), the Town Clerk of Warwick (Mr. Brabazon Campbell), Mr. T. H. G. Newton, and Mr. Frederick H. Moore (Secretary of the Local Committee).

Apologies for Non-Attendance.

Apologies for non-attendance were received from H.R.H. Prince Christian, K.G., the Duke of Richmond and Gordon, K.G., General Viscount Bridport, G.C.B., Viscount Emlyn, Lord Egerton of Tatton, Sir Jacob Wilson, Mr. W. Frankish, and Mr. E. V. V. Wheeler.

Letter from H.R.H. Prince George of Wales.

The minutes of the last monthly meeting of the Council, held on April 6th, having been approved, the PRESIDENT read a letter addressed to him by H.R.H. Prince George of Wales, K.G., expressing thanks for his election as a Governor of the Royal Agricultural Society, and stating that he regarded it as a great compliment and honour to have been elected as a Governor of such an important body.

Election of New Members.

The election of the following 130 Members was proceeded with as follows:—

ABRAHAM, C. A...Appleby Magna, Atherstone.
AKITT, John..Huntington Hall, Chester.
ALDERSON, E...Leyburn, Bedale.
ANDERSON, W...Corra Linn, Leamington.
ARDRON, J. T...Syston, Leicestershire.
ASHWORTH, A. J...Frodsham, Cheshire.
ATKINSON, J. B...Winterhome, Leamington.
ASKEW, J. B...Bishopstone, Hereford.
BACH, R...Park Farm, Craven Arms, Salop.
BEECH, Major R. J...Brandon Hall, Coventry.
BEVAN, J...Llandowlais, Llangibby, Usk.
BOCOCK, G...Ashley, Newmarket, Cambs.
BOULTBEE, H. T...Park House, Warwick.
BOWER, A. W. C...Bretby, Burton-on-Trent.
BOWSER, C. H...Bingham Lodge, Holbeach Marsh.
BROWN, G. C...Winson, Fairford, Glos.
BUCKLEY, E...Milford Hall, Newtown, Mont.
CAMPBELL, Brabazon..Warwick.
CATHERALL, J...Buckley, Flintshire.
CHADWICK, S. B...Crofton Lodge, Runcorn.

CHALLINOR, R...32 Eaton Road, Chester.
CLARKE, T...Crossrigg, Penrith.
COCKBURN, N. C...Hartsholme Hall, Lincoln.
COLE, W. J. L...Frickley, Doncaster.
COOK, T. J...Brewers Hill, Dunstable.
COOPER, G. H...Inglesham, Lechlade.
COULTAS, J. P...Grantham.
CROSS, T...Bentley Heath, Knowle.
CROSSMAN, L. M...Goswick, Beal.
DAVID, E. U...Llandaff, Glam.
DEER, E...Stratford-on-Avon.
DILLON, A. H...Castle Howard.
DOWNS, J...The Old Foundry, Hull.
DURLEY, Thomas..New Oscott, Birmingham.
DUTTON, T...Ash House, Brindley, Nantwich.
DUTTON, W...Brindley Hall, Nantwich.
DUTTON, W. J...Brindley Lea Hall, Nautwich.
EAMES, T. D...Cotley, Chard, Dorset.
EDDINGTON, Wm...18 Railway Approach, S.E.
EMBERTON, J...Town Ho., Buerton, Nantwich.
FEILDEN, R. O...7 Sussex Gardens, Hyde Park.
FINN, H. A...Sole Street Ho., Selling, Kent.
FLEMING, T...Gaydon, Warwick.
FORSTER, P. F..Malverleys, E. Woodhay, Hants.
FRITCHLEY, J. W...Austerfield, Bawtry.
GALWAY, Viscount..Serlby Hall, Bawtry.
GILL, John..Gwealhellis, Helston.
GREGORY, G. F...Boarzell, Hurst Green.
GRIFFIN, H. R...36 Worship Street, E.C.
HANBURY, J. M...The Brewery, Spitalfields, E.
HARDY, T...Mere Hall Farm, Knutsford.
HARTLEY, J. D'Arcy..Chorlton Hall, Malpas.
HESKETH, T...Plumpton Hall, Penrith.
HEYWOOD, R..Sudbourne Hall, Wickham Mkt.
HOBBS, C., jun...Bampton, Farringdon.
HOLMAN, A...Little Paxton, St. Neots.
HORTON, J...The Woodlands, Moseley, Birm.
HOULDSWORTH, H. J...Pilmuir, Torquay.
HOWARD, Hon. Mrs. Cecil..Dutchlands, Great Missenden, Bucks.
HUGHES, A. S...Hadleigh, Essex.
HUGHES, J. W...Gt. Rollright, Chipping Nrtn.
IMESON, R...Sutton Grange, Masham.
IVES, W. D. G...Bradden House, Towcester.
JOHNSON, J. F...The Close, Nuneaton.
JONES, E. P...Newtown Hall, Mont.
JONES, J...The Hollies, Churchstoke, Salop.
KING, T. P...Standish House, Stonehouse.
KNIGHTLEY, Rev. H. F...Wasperton Vicarage, Warwick.
LELY, J. M..23 Sumner Place, Onslow Sq., S.W.
LE MAY, W. H...67 Borough High Street, S.E.
LEVI, W. J...Woughton House, Bletchley.
LIGHTFOOT, F. P...Drayton Manor, Tamworth.
LIVERSEDGE, F. C...Great Crosby, Lancs.
LORAM, A. T...Exeter.
LOWE, T...Walton, Derbyshire.
LUKES, T. H...St. Austell.
MACKINTOSH, H...Cottrell, Cardiff.
MADELEY, E...Stapenhill, Derbyshire.
MANDER, S. T...Wightwick Manor, Wolverhampton.
MARSHALL, Capt. H. S...Gainford, Darlington.
MATTHEWS, C...Norton-in-Hales, Cheshire.
MENCE, J. T...Salwarpe Court, Droitwich.
MILLER, S. C...32 High Street, Banbury.
MONCKTON, W...Ightham Park, Kent.
NEWARK, G...Coundon, Coventry.
NOAKES, T...Cookham Hill, Borstal, Rochester.
OKELL, T. L...Pulford, Chester.
ONSLOW, A. R...The Furnace, Newent, Glos.
OWEN, C. E. J...Hengwrtucha, Dolgelly.
PALMER, W...Junction Road, Andover, Hants.
PARKINSON, P...Turton, Bolton.
PAYN, H...32 Fore Street, Tiverton.
PEARCE, A. J. H...Starkie's Castle, Wouldham, Kent.
PEMBERTON, R. H...Beaulieu, Southampton.
PERKIN, A. W...Greenford Green, Harrow.
POTTER, R. S...Hawkeswell, Coleshill
POTTS, A. E...Heron Bridge, Chester.
PRATT, C. A...Rushford, Evesham.
PRIESTMAN, J...73a Queen Victoria St., E.C.
RADCLIFFE, T...Church Aston Manor, Newport, Salop.
RANSTEAD, W...Somerville, Seacombe.
ROBERTS, T...Tan-y-fynwent, Aber, Bangor.
SADLER, W...Tatteuhall, Chester.
SCOTT, J. S...Ridgway Ho., Oxted, Surrey.
SHILLITO, M...63 Fore Street, E.C.
SILLITOE, A...Alvecote Priory, Tamworth.
SMITH, W. R...Red Ho., Compton, Wolverhampton.
SMYTH, J. J...Peasenhall, Saxmundham.
SOWERBY, E. C...Staindrop, Darlington
SPEAKMAN, P...Higher Runcorn.
STEPHENSON, H...Crawleas Farm, Windleston, Ferryhill.
STEVENS, J. W. A...Penhill, Cardiff.
STOBBS, R. W...Outchester Manor, Belford.
STOKES, J. W...Pengwern Hall, Rhuddlan.
THOMPSON, W...Norton, Derbyshire.
TOLLER, J. C...Godmanchester.
TOWNSHEND, W...Gilson Hall, Coleshill.
TOWNSON, J...Evenwood Gate, W. Auckland.
VANE-TEMPEST, Lord H. J...Plâs, Machynlleth.
WALKER, F. T...5 Warwick Terr. Leamington.
WALKINSHAW, F..Hartley Grange, Winchfield.
WALTON, G. K...Radford, Leamington.
WARDE, Major C. E...Barham Crt., Maidstone.
WARRE, G. A...Penerley Lodge, Beaulieu.
WAY, Rev. J. P...King's Sch., Myton, Warwick.
WELLS, W...New Ho., Weston, Leamington.
WESTON, E...Over Whitacre, Coleshill.
WILLIAMS, A. J...Coedymwrther, Bridgend.
WOODS, T. C...2 Deangate, Northampton.
WRIGHT, A. I...Heathlands, Knutsford.

Nomination of New Members.

On the motion of Sir NIGEL KINGSCOTE, it was resolved:—

That the Secretary be authorised to receive nominations of Members, and to admit them to the privileges of membership for the Warwick Meeting, on condition that they sign the usual contract and pay their subscriptions for the current year.

Finance.

Sir NIGEL KINGSCOTE (Chairman) reported that the accounts for the month of April, as certified by the Society's Accountants, showed receipts amounting to 3,450*l.* 10*s.* 3*d.* and expenditure 4,596*l.* 10*s.* 11*d.* The balance at the bankers on April 30, allowing for cheques outstanding, was 7,156*l.* 0*s.* 3*d.* Accounts amounting in all to 2,132*l.* 18*s.* 3*d.* had been passed, and were recommended for payment. The Committee recommended that Mr. Frankish and Mr. Sanday be appointed Stewards of Finance at the Warwick Meeting. The Committee had considered the case of an exhibitor who had sent coin

in an unregistered letter in payment for his entry fee, and the Committee recommended that, in future prize sheets, it be made a condition that no entries will be accepted, the fees for which are forwarded through the post in coin in unregistered letters.

Journal.

Earl CATHCART (Chairman) reported that the articles to appear in the next number of the Journal had been discussed, and directions given thereon. Tenders for the printing of the posters and placards for the Society's country meetings had been considered, and the Committee recommended the acceptance of that of Messrs. Jas. Truscott and Son for a period of three years. Letters had been read from the proprietors of various sheep dips protesting against a note by Mr. P. R. Gordon on the Cure of Sheep Scab which appeared in the last number of the Journal. After careful consideration of these letters, the Committee had agreed to the following resolution, which they submitted for the approval of the Council:—

> Messrs. William Cooper and Nephews, and other manufacturers of proprietary Sheep Dips, having called the attention of the Council to a paper which appeared in the March number of the Journal by Mr. P. R. Gordon, Chief Inspector of Stock in Queensland, animadverting on those Dips, the Council wish at the earliest moment to announce publicly that they do not themselves accept the whole of the views expressed by Mr. Gordon with regard to these preparations, and to express their regret that they should have inadvertently given publicity, in the columns of their Journal, to statements which were not necessary for the scientific objects they had in view, and which might prove injurious to the proprietors of the preparations in question.

After some observations by Earl CATHCART, Mr. DENT, and the Hon. CECIL T. PARKER, this resolution was put and carried unanimously.

Chemical.

Mr. WARREN presented the report of this Committee, and that of the Woburn Sub-Committee, and stated that the Committee had agreed upon the terms of the memorandum as to their past action with regard to the adulteration of fertilisers and feeding stuffs, which had been prepared for the information of the Departmental Committee appointed by the Board of Agriculture (see page 350).

Seeds and Plant Diseases.

Mr. WHITEHEAD (Chairman) presented various recommendations from this Committee as to the Society's potato experiments during the forthcoming season, and also a schedule of prizes which they suggested should be offered at the Chester Meeting for cider, perry, jams, preserved fruits, &c.

Sir MATTHEW RIDLEY raised the question as to the usefulness of continuing the offer of prizes for cider.

Mr. WHITEHEAD admitted that there was not very much competition for these prizes, but the Committee thought it desirable to encourage all kinds of industries connected with agriculture.

Mr. NEVILLE GRENVILLE hoped the prizes would be continued.

After some further discussion, in which the Hon. CECIL T. PARKER, Mr. SANDAY, Mr. WHITEHEAD, and others took part, the Committee's proposals as to potato experiments were approved, and the suggested schedule of prizes was referred to the Stock Prizes Committee for consideration.

Veterinary.

Sir JOHN THOROLD (Chairman) reported that in reply to the Council's inquiry of last month as to whether the powers of the County Council Committees under the Contagious Diseases (Animals) Acts ceased upon the dissolution of the Councils, or continued in force until the appointment of the new Committees, the following letter had been received from the Local Government Board:—

Local Government Board,
$\frac{34{,}304\ C}{1892}$ Whitehall, S.W.,
May 2nd, 1892.

Sir,—I am directed by the Local Government Board to advert to your letter of the 6th ultimo, and in reply to state that they have no

power to determine whether the Committee appointed by a County Council under the Contagious Diseases (Animals) Acts could continue to act after March 8 (the ordinary day of retirement of County Councillors) in a year in which such Councillors are elected. The question appears to depend upon the conditions on which the Committee were appointed as regards period of office.

The Board do not think that such a Committee could not under any circumstances continue to act after the date mentioned, although the Councillors on the Committee might cease to be members of the Committee on that day.

I am, at the same time, to inform you that the Board have been in communication with the Board of Agriculture on the subject, and that the point has been noted for further consideration in the event of the introduction into Parliament of any Bill in which provision could be made on the subject.

The difficulty to which you refer cannot, of course, again arise until the year 1895, when County Councillors now in office retire.

I am, Sir,
Your obedient servant,
(Signed) S. B. PROVIS,
Assistant Secretary.

The Secretary,
Royal Agricultural Society of England.

A letter had been received from Mr. T. Horton, accepting the terms of his appointment as the Society's provincial veterinary surgeon for the county of Warwick. Copies were laid upon the table of the third edition of Professor Brown's pamphlet on the structure of the horse's foot and the principles of shoeing, just issued from the press.

Professor BROWN had presented the following report :—

FOOT-AND-MOUTH DISEASE.—At the time the last meeting of the Committee was held, this disease existed in Perthshire and Midlothian in Scotland, in the neighbourhood of Manchester in Lancashire, at three places in Cheshire, two in Essex, and one in London: at several places near Sittingbourne in Kent, and in the neighbourhood of Cuckfield and Patcham in Sussex. It is now confined to the Sittingbourne district in Kent, all the affected animals in the other districts having recovered some little time ago.

PLEURO-PNEUMONIA. — During the past five weeks five fresh outbreaks of this disease occurred in Great Britain, in the counties of Durham, Surrey, and York (West Riding) in England, and Midlothian in Scotland.

SWINE FEVER.—The returns of this disease still continue very low as compared with former years. At the present time the fresh outbreaks average about fifty a week; at this time last year they numbered over 140 per week.

ANTHRAX.—Outbreaks of this disease have within the last month occurred in the counties of Chester, Dorset, Essex, Hereford, Kent, Lincoln (Holland), Norfolk, Notts, Wilts, York (West Riding) in England, and Aberdeen and Ayr in Scotland.

Stock Prizes.

Mr. SANDAY (Chairman) reported that a letter had been received from Mr. Andrew Mitchell, the exhibitor of the Ayrshire cow "Eleanor," which won the first prize of 10*l.* in Class 92 at the Doncaster Meeting, and which animal was subsequently sold to go to New South Wales, stating that the cow had calved prematurely in that Colony, but that the calf was living when calved, and enclosing a certificate signed by Mr. F. W. Day, M.R.C.V.S., the purchaser, to that effect. The Committee recommended that, as the cow produced a living calf, the award be confirmed, and the prize money be paid to Mr. Mitchell. Further correspondence as to the Shire stallion, Prince Harold, exhibited by Mr. Peter Blundell at the Society's Doncaster Meeting, had been considered, and the following gentlemen had been appointed a Sub-Committee to obtain further information and to make such investigations as they considered necessary for clearing up the matter: The Chairman, Hon. Cecil T. Parker, Mr. Stratton, and Mr. Garrett Taylor.

Letters of inquiry relative to various entries of stock for the Warwick Meeting, and also entry forms received in an incomplete state, had been submitted to the Committee, and instructions given thereon. A list had been submitted of prizes for cheese and cheese-making, proposed to be offered by the Chester Local Committee for the meeting at Chester in 1893, and the Committee unanimously decided that the offer of such prizes be accepted with thanks (see page lxxiv). The Committee had confirmed their resolution of last month with reference to a grant of 5,000*l.* for prizes for the Chester Meeting. In the event of their Chairman's motion on the subject being adopted by the Council, they proposed to give preliminary consideration to the Chester Prize Sheet at their next meeting to be held on Tuesday, May 31.

Premiums to Thoroughbred Stallions.

Mr. SANDAY said that when last month he gave notice of the motion which stood in his name on the agenda paper, his friend Sir Jacob Wilson—whose absence from illness they all regretted—appealed to him to postpone the motion, on the ground that November would be a more convenient date to discuss the matter. He (Mr. Sanday) thought then, and he still thought, that it was very desirable in the interests, both of the Royal Commission and of the Society, that this matter should be settled at the earliest possible opportunity. When the scheme was first suggested in 1887, it was started by the Society as an experiment; and when, not long after, it was taken up by the Government and the Royal Commission on Horse Breeding was appointed, he thought the mission of the Society, and the object with which they had started the premiums, had been fulfilled, and that that would have been the most desirable time to stop the contribution. This, however, was not done, and the matter had been allowed to drift on for some years longer. The argument which had been generally used in favour of the continuance of the grant by the Society had been that the withdrawal of the premiums would to a great extent endanger the success of the whole scheme. He thought himself, and he believed his opinion was shared by a great many members of Council and by those outside the Council, that this would not be the case. He thought that smaller premiums would bring forward equally good horses and with equally satisfactory results. That, however, was a matter for the consideration of the Royal Commission on Horse Breeding. The Council had really to decide whether, in the interests of the general body of their members, it was desirable to continue the contribution, or whether the money could not be devoted to more profitable objects. It appeared that since 1887, when the scheme was started, the net cost to the Society of these premiums had been 4,186*l.* 3*s.* He had himself, as a member of the Hunter Stallion Committee, been identified with the movement from the commencement, and had taken great interest in it; but he did think it was time now that the contribution from the Society should cease. He therefore moved, "That the grant of 600*l.* heretofore made to the Royal Commission on Horse Breeding be discontinued for the future."

Mr. DENT was very glad indeed to find this question brought before the Council, fortified by the recommendation of the Chairman of the Stock Prizes Committee. He had always considered that to devote 600*l.* a year for this purpose was not justifiable, as compared with the amount of prizes given to other descriptions of agricultural stock. He also regarded it as the duty of the Government, if they considered that they had a mission for doing this kind of work, to find sufficient funds for the whole of the country. He had great pleasure in seconding the motion.

The Earl of COVENTRY was sure that all those who took interest in horse-breeding would be sorry to find that the Stock Prizes Committee could not see their way to continue the grant of 600*l.* a year, and that the matter could not be postponed—as Sir Jacob Wilson wished — until November, or at least until the Com-

mission had had another meeting. But he wished to say for his colleagues on the Royal Commission that they appreciated very highly the generous assistance which had been given by the Society towards the improvement of horse-breeding, and they would quite understand the reasons why this could no longer be given. If it should be decided that the grant must be discontinued, then he hoped the Society would be able to see its way to restore to the prize list the prizes which it originally gave for thoroughbred horses.

Mr. ALFRED J. SMITH had great pleasure in supporting the resolution of the Chairman of the Stock Prizes Committee. He thought they as an agricultural society had perhaps no right to show so much preference to the thoroughbred stallions and the breeding of hunters, over and above the money they voted to the draught horses of the heavy breeds. They in the county of Suffolk had been very liberally provided with stallions from the very first-rate establishments of the Duke of Hamilton and other landlords. They had tried the experiment for the past twenty years, and they found that it was much more profitable for the tenant-farmer to go back to the breeding of heavy and draught horses. He understood that in certain cases the amount of the premium for the service of fifty mares had exceeded the selling price of the stallion to which the premium had been awarded. On the other hand, he thought any foreigner must be surprised that he was not allowed to see in their show-yards a specimen of any of their beautiful heavy breeds in the stallion classes, after they had arrived at maturity or at their proper age. That was a point to which the Stock Prizes Committee ought to give greater consideration.

The motion for the discontinuance of the grant was then carried *nem. dis.*

Prize Sheet for Chester Meeting of 1893.

Mr. SANDAY then formally moved, pursuant to notice, and Mr. TERRY seconded—

That the sum of 5,000*l.* be placed at the disposal of the Stock Prizes Committee for providing prizes for live stock, poultry, and produce at the Chester Meeting of 1893.

Sir MATTHEW RIDLEY expressed the hope that the grant of 5,000*l.*, if carried, would not be taken as a precedent for future years. 5,000*l.* was a very large sum to give for prizes, and he thought that the Council should know whether they were expected to bear, in addition to the amount of the prizes, the very large expenditure (often amounting to some hundreds of pounds) involved in making the necessary inspections for the awards of prizes for farms. If these competitions were of real benefit to the district in which the show was held, he would be the last to object to them; but as the competitions had now been going on for more than twenty years, and almost every county had been visited, he thought it was desirable that the question of their continuance should receive consideration. He desired, therefore, to move as a rider to Mr. Sanday's motion, "That it be referred to the Journal Committee to consider whether it is desirable that the Society should accept in the future any prizes for farm competitions, and that they be requested to bring up a recommendation on the subject at the next meeting of the Council."

Mr. STRATTON agreed with Sir Matthew Ridley, and said that there were in every district specialists in farming whose practice ought to be reported upon. Such men as these would not, however, enter for the competitions, and the reports in the Journal did not, therefore, take account of their farms.

Mr. GARRETT TAYLOR said his experience, as Judge of farms on two previous occasions, showed him that the best men in the district did not enter into competition for the prizes. He seconded the motion with much pleasure.

Earl CATHCART pointed out that one advantage of the farm competitions was the valuable reports on the competing farms which the Society obtained for the Journal. The question raised by Sir Matthew Ridley should, however, receive the very careful consideration of the Journal Committee.

Sir NIGEL KINGSCOTE said that, as Chairman of the Finance Committee,

he must call the attention of the Council to the very serious proposition made by Mr. Sanday for a grant of 5,000*l.* to be given in prizes for the Chester Meeting. Last year, when they went to Doncaster—probably about the best paying place to which they would go for a long time—they only cleared their expenses by 100*l.* Was the Council prepared to give 5,000*l.* each year for the Stock Prizes Committee to divide? He would remind them that when this question was raised last year, the Finance Committee reported in April, 1891, that "they had again carefully considered the question of the limitation of the Society's prize sheet for stock and produce, as to which they had submitted repeated recommendations in the past. They desired to refer to their memorandum on the subject, presented to Sir John Thorold's Committee on February 1, 1888, and to again express their adherence to their resolution of December 12, 1883, that in future the limit of 3,500*l.* for prizes for live stock should not be exceeded. They thought that an additional sum of 500*l.* should be sufficient for the poultry and produce classes in the prize sheet." They were now asked to increase the grant from 4,000*l.* to 5,000*l.* Certainly, the Society had decided not to give the 600*l.* for the stallion premiums, but still there seemed to him to be no limit. Almost every year, or every two years, they were asked by the Stock Prizes Committee to add another 500*l.* or 1,000*l.* to the prize sheet. He thought the Council ought to know that, while they were continually augmenting the prize sheets, their financial prospects as regarded their shows were not improving, as the attendance did not increase in proportion to the growth in the size of the yard and the consequent expenditure. He thought that to give so large a sum as 5,000*l.* required, on financial grounds, very careful consideration.

Mr. SANDAY said he felt that the sum asked for was a very large one. But he would also say that they had very great outside complaints that their prize-sheet was not made popular enough, and, as had been noticed that day, they had many claims upon them for prizes from other committees which a few years ago did not exist at all. He could only say, with regard to his own position as Chairman of the Stock Prizes Committee, that he thought the sum of 5,000*l.* ought not to be exceeded, and that, so far as he was concerned, he should use his best endeavours to see that it was not, if the Council acceded to the request.

Mr. Sanday's motion was then carried unanimously, together with the rider moved by Sir Matthew Ridley.

Implement.

Mr. NEVILLE GRENVILLE reported that the Allotment Committee had allotted the stands to the several exhibitors who had applied for space in the Implement Department at the Warwick Meeting, and that the amount of shedding allotted was: Ordinary shedding, 8,241 ft.; special shedding, 2,151 ft.; machinery in motion, 2,119 ft.; total, 12,511 ft. (exclusive of open ground space). The Committee had settled the regulations for the trials of sheaf binders at Chester in 1893, and recommended their adoption by the Council as follows:

Prizes for Sheaf Binders.

In connection with the Chester Meeting of 1893, a first prize of 50*l.*, a second prize of 30*l.*, and a third prize of 20*l.* are offered by the Royal Agricultural Society of England for the best self-binding harvester (using other binding material than wire).

REGULATIONS FOR TRIALS.—1. The trials will take place during the harvest of 1893, on land selected by the Society in the neighbourhood of Chester.

2. The necessary arrangements for the crops required for the trials will be made by the Society.

3. Notice of the place and date of the trials will be posted to every competitor as soon as they are fixed.

4. Every competitor must himself provide for the delivery of his machines on the trial ground, and for the removal of the same after the trials.

5. Horses will be provided by the Society to work the machines during the trials, but competitors who desire it may provide their own horses.

6. Every machine must be delivered at the *dépôt* on the trial grounds in proper working order, not less than three days previous to the commencement of the trials. The Society will, if desired by an exhibitor, take charge of the sheaf binder with which he intends to compete between the time of its exhibition at the Chester Meeting and the periods of the trials, but will not be responsible for any damage.

7. Exhibitors must provide their own drivers and attendants, but the Society reserves the right to provide men and to work the machine of any exhibitor who is absent, or not ready, or who says that his men are absent, after due notice has been given to him to bring his machine out for trial. A competitor shall not be required to work more than one of his machines at the same time.

8. Before starting work, the exhibitor must declare the number of men and horses required by his machine. If he personally, or any other extra attendant not included in such declaration, shall render any actual assistance in working or adjusting the machine during the trial, the fact will be noted by the judges.

9. The attention of the judges and engineers will be particularly directed to the following matters:—

1. Cost.
2. Simplicity of construction.
3. Draught.
4. Time.
5. Weight in reference to draught.
6. Clean work and freedom from waste.
7. Easy handling.
8. Good sheafing.
9. Efficient binding.
10. Quality and cost of binding materials.

10. Should the judges find any of the machines to be of practically equal merit, they are empowered to bracket them as equal, and so divide the prize money.

11. Lots will be drawn for each series of plots.

12. Machines are not to be worked under conditions as to weather and crop when such machines would not be used in the actual work of a farm.

13. Entries for these prizes must be made by exhibitors on the ordinary forms of application for space in the implement department of the Chester Meeting, which will be issued in December, 1892; but the machine need not necessarily be exhibited at the Chester Meeting. The last date for receiving entries for the prizes will be Saturday, April 1st, 1893.

By order of the Council,
ERNEST CLARKE, Secretary.

12 *Hanover Square, London, W.*,
May 4th, 1892.

General Warwick.

Mr. DENT reported that the Committee had considered and approved the provisional programme for the Warwick Meeting, and had granted, on the usual conditions, applications from the Shire Horse Society, the Hackney Horse Society, Hunters' Improvement Society, Shorthorn Society, Hereford Herd Book Society, Shropshire Sheep Breeders' Society, and the Cotswold Sheep Society, to hold meetings in the Warwick showyard.

Showyard Works.

Mr. CLAY reported that the implement yard at Warwick was completed, and all the stands had been allotted. About 300 horse-boxes and about 2,000 feet of cattle-sheds had been erected, and the works generally were in a very forward state. The Local Committee had completed the levelling of the ground, and all the principal water mains were laid. The following offers had been accepted by the Committee:—(1) Messrs. Perkins for the supply of floral decorations; (2) Messrs. Plucknett and Co., furnishing of Royal Pavilion free of charge; (3) National Telephone Company for telephonic communication in the showyard free of charge. The Committee recommended that Messrs. Margetts and Son and Messrs. Whittindale and Dyer be appointed joint auctioneers for the sale of the materials after the show.

Selection.

Earl CATHCART (Chairman) having read the recommendation of this Committee as to the nomination of

the President of the Society for the ensuing year,

H.R.H. the PRINCE OF WALES said he had great pleasure in moving "That the name of his Grace the Duke of Westminster be recommended to the General Meeting as President for the ensuing year." (Cheers.)

Earl CATHCART seconded the motion, which was unanimously adopted.

The DUKE OF WESTMINSTER said he was greatly indebted to His Royal Highness and to the Council for nominating him as President for the coming year. He very highly appreciated the honour proposed to be conferred upon him, and if he could be of any use to the Society, it would give him the greatest pleasure to do what he could to further its interests.

Education.

Lord MORETON (Chairman) said the Committee had had under consideration the arrangements to be made for the fourth edition of the Society's Text Book ("Elements of Agriculture"), which would shortly be required, and for which the Committee had decided to prepare a series of fresh illustrations.

Dairy.

The Hon. CECIL T. PARKER (Chairman) reported that an unofficial conference had been held on Monday between Sir John Thorold, Mr. Sanday, and himself, as representing the Society, and the President (Mr. Hugh C. Smith), and the president-elect (Mr. J. F. Hall), of the English Jersey Cattle Society, upon the subject of a proposal which had been made by the latter Society for a competition of dairy cattle, the prizes in which should be awarded upon a butter-test made by the churn. The personal representations of the English Jersey Cattle Society having been carefully discussed, it had been eventually resolved to recommend that an endeavour should be made by the Society to carry out, if possible, a competition in one class upon the principle suggested, in connection with the Chester Meeting of 1893.

Having considered recent cases of fraud in the sale of margarine as butter, contrary to the provisions of the Margarine Act of 1887, the Committee recommended that the matter be referred to the Chemical Committee. The Committee recommended that arrangements be made as last year for receiving the milk from cows in the Warwick Showyard at the rate of 8*d.* per Imperial gallon, in accordance with Regulation 56 of the prize sheet, and that a notice be sent to the exhibitors requesting them to instruct their servants to conform to this regulation.

Retiring Members of Council.

The SECRETARY submitted, in compliance with Bye Law 23 (c), the list of the members of Council retiring by rotation, but eligible for re-election at the General Meeting, to be held on Monday, the 23rd instant (see page lix).

Country Meeting of 1894.

On the motion of Mr. MAINWARING, seconded by Mr. CRUTCHLEY, it was resolved that the Country Meeting of 1894 be held in District A, which consists of the counties of Bedford, Buckingham, Cambridge, Essex, Hertford, Huntingdon, Middlesex, Norfolk, Oxford, and Suffolk.

Mr. MARTIN inquired by what time invitations from towns in this district desirous of receiving the Society must be sent in?

The SECRETARY replied that such invitations were usually received during the autumn and reported to the general meeting held in December. The Committee of Inspection was usually appointed at the November or December meeting of Council, and made its inspection at the end of January, reporting to the Council in February. The decision therefore as to the place of Meeting for the year 1894 would, in the ordinary course, be made by the Council at their meeting to be held in February, 1893.

Date of Next Meeting.

The report from the Council to the General Meeting to be held on the 23rd inst. having been prepared, the Council adjourned till Wednesday, June 1 next, at 10.30 A.M.

WEDNESDAY, JUNE 1, 1892.

THE EARL OF FEVERSHAM (PRESIDENT) IN THE CHAIR.

Present:—

Trustees.—Gen. Viscount Bridport, G.C.B., Earl Cathcart, Mr. John Dent Dent, Col. Sir Nigel Kingscote, K.C.B., Sir A. K. Macdonald, Bart., Earl of Ravensworth, Duke of Richmond and Gordon, K.G.

Vice-Presidents.—H.R.H. Prince Christian, K.G., Earl of Lathom, Lord Moreton, Sir J. H. Thorold, Bart., Mr. Charles Whitehead.

Other Members of Council.—Mr. G. M. Allender, Mr. Alfred Ashworth, Mr. J. Bowen-Jones, Lord Brougham and Vaux, Mr. Charles Clay, Mr. Percy E. Crutchley, Lieut.-Col. J. F. Curtis-Hayward, Mr. Alfred Darby, Mr. J. Marshall Dugdale, Mr. Hugh Gorringe, Mr. Anthony Hamond, Mr. James Hornsby, Mr. Charles Howard, Mr. C. S. Mainwaring, Mr. Joseph Martin, Mr. T. H. Miller, Mr. P. A. Muntz, M.P., Hon. Cecil T. Parker, Mr. Samuel Rowlandson, Mr. G. H. Sanday, Mr. W. T. Scarth, Mr. A. J. Smith, Mr. Henry Smith, Marquis of Stafford, Mr. E. W. Stanyforth, Mr. Martin J. Sutton, Mr. Garrett Taylor, Mr. John Tremayne, Mr. R. A. Warren, Mr. E. V. V. Wheeler, Mr. C. W. Wilson, Sir Jacob Wilson.

Officers.—Mr. Ernest Clarke, Secretary and Editor; Dr. J. Augustus Voelcker, Consulting Chemist; Professor J. B. Simonds, Consulting Veterinary Surgeon; Mr. Wilson Bennison, Surveyor.

The following members of the Warwick Local Committee were also present:—Lord Leigh (Chairman), Lord E. J. Seymour, the Mayor of Warwick (Mr. J. W. Mann), the Mayor of Leamington (Mr. John D. Barbour), the Town Clerk of Warwick (Mr. Brabazon Campbell), and Mr. J. W. Margetts.

Apologies for Non-Attendance.

Apologies for non-attendance were received from Viscount Emlyn, Sir Joseph Spearman, Bart., Mr. S. P. Foster, Mr. W. Frankish, and Mr. Stratton.

Election of New Governor and Members.

The Minutes of the last Monthly Meeting of the Council, held on May 4th, having been approved, the election of the following Governor and 76 Members was proceeded with as follows:—

Governor.

DE TRAFFORD, Sir Humphrey, Bart.. Trafford Park, Manchester.

Members.

ABBOT, R... Rookery Farm, Thuxton, Hingham.
AFFLECK, A... Holt Hall, Kingsbury, Tamworth.
BALDWIN, S... The Hermitage, W. Derby, Liverpool.
BELL, W. C... Bodrhyddan, Rhyl.
BENTINCK, H. A... Terrington St. Clement.
‡BISSET, J... 22 Orford Street, Chelsea, S.W.
BRINDLEY, F... Astbury, Congleton.
BURTON, R. W... Upper Bedford's Farm, Havering.
‡CAMPBELL, J... The University, Edinburgh.
CHEERS, E... Four Lanes End Farm, Tarporley.
CLIFT, L. E... 1 Holborn Place, W.C.
COOPER, F... Langley Hall, Sutton Coldfield.
‡COWARD, T. A... The University, Edinburgh.
CRIPPS, E. W... Ampney Park, Cirencester.
CRUTTENDEN, E. H... Borras Farm, Gresford, Wrexham.
DAVIES, N... Ash Grange, Whitchurch, Salop.
DAY, H... Ailston, Stratford-on-Avon.
DE VOGÜÉ, Marquis.. 2 Rue Fabert, Paris.
DRAGE, B. F... Chapel Brampton Grange, Northampton.
DURANT, W.. 135 Boundary Street, Liverpool.
EMERSON, W... Sweldon Farm, Caerau, Cardiff.
FENTON, W. J... Gortou Lodge, Rugeley.
FITZHERBERT, B... Swynnerton Park, Stone, Staffs.
‡FOULKES, P. H.. The University, Edinburgh.
‡FULTON, E. A... The University, Edinburgh.
GARRARD, F. B... Sandstone, Uxbridge.
GEORGE, T... The Deri Farm, Whitchurch, Cardiff.
GOODALL, T. V... Stoke Grange, Market Drayton.
GORE, F.. The Priory, Tetbury.
GREVILLE, Hon. Sidney R.. Warwick Castle.
HALL, John.. Parsons Lane, Bury.
HAWKES, J.. Bearless, Stratford-on-Avon.
HEYWOOD, H. A.. Duckington Grange, Malpas.
HICKS, S. E.. Wilbraham Temple, Cambridge.
HIRONS, E. Geo... Shorthampton, Charlbury.

‡ Life Member by Examination.

HOWARD, H. R. L..Wygfair, St. Asaph.
HULL, R..Edleston Farm, Nantwich.
JEFFERSON, John..Peel Hall, Chester.
†JENKINSON, John..R. A. C., Cirencester.
KENWARD, J..Hamsey Place, Lewes.
KNIGHTLEY, C. V..Fawsley, Daventry.
LEE, Major-Gen..Richmount, Glam.
LITTLE, Major A. C..Barford, Warwick.
MARGETTS, J. W..Ashberry House, Warwick.
MATTHEWS, G. B..The Kendalls, Gillingham.
MITCHELL, R. G..Henley in-Arden.
MOORE, W..Preston Bagot, Henley-in-Arden.
MORGAN, W. A..Oxhouse, Shobdon, Hereford.
MURRAY, J. T..104 King Street, Manchester.
NEAL, W..Kingsdon, Taunton.
NEASOM, W..Birchensale Farm, Redditch.
NEWCASTLE, Duchess of..Clumber, Worksop.
NUTT, H. J..Fillongley, Warwicks.
ONSLOW, W. A..Preston Bagot Ho., Warwicks.
OWEN, Peter..Capenhurst, Chester.
PALMER, G..Revells Hall, Hertford.
PEACOCK, C..Bearpark Lodge, Durham.
PELLY, L..Bowes, Ongar.
POWELL, E. T..Three Cocks, Brecon.
POWELL, G. H. C..3 Middle Temple Lane, E.C.
RENNIE, Capt. J. H. W...Willoughby Hall, Grantham.
ROBERTS, J..Marsh Farm, Eccleshall.
ROBINSON, A. J..Malpas.
ROCHFORD, T..Turnford Hall, Broxbourne.
ROSE, Samuel..Rugby.
STARKEY, R. B..Melbourne Road, Leicester.
STONE, J. B..Erdington, Birmingham.
TORY, H. J. S..Sturminster Marshall, Wimborne.
WACHER, J..Throwley, Faversham.
WARREN, T. H..Broughton Mill, Northampton.
WEBB, F. W..Stanway Manor, Rushbury, Church Stretton, Salop.
WHITLEY, A. N. J..R. A. C., Cirencester.
†WHITE, W. E. C...Aspatria Agricultural College.
WIGGIN, A H..Selly Oak, Birmingham.
WILKINSON, F. B..Blyth Spital, Notts.
WOLFERSTAN, C. A. P..Statfold Hall, Tamworth.

The reports of the various Standing Committees were then received and adopted as below :—

Finance.

Sir NIGEL KINGSCOTE (Chairman) reported that the accounts for the period from May 1 to May 28, 1892, showed total receipts amounting to 1,967*l.* 11*s.* 8*d.*, and expenditure amounting to 2,141*l.* 18*s.* 9*d.* The balance at the bank on May 28, allowing for cheques outstanding, was 6,981*l.* 13*s.* 2*d.* Accounts amounting in all to 5,876*l.* 9*s.* 7*d.* were recommended for payment.

House.

Sir NIGEL KINGSCOTE presented a report from this Committee, which was ordered to be considered at the next meeting of the Council to be held in London (Wednesday, July 27).

† Life Member by Examination.

Journal.

Earl CATHCART (Chairman) reported that the arrangements for the next number of the Journal had been discussed and settled. An exchange of publications with the German Agricultural Society (Deutsche Landwirthschaft-Gesellschaft) had been arranged. A request by the East Suffolk Technical Instruction Committee for permission to reprint a note by Mr. A. J. Smith on the technical training of stockmen, which it was hoped to publish in the next number of the Journal, had been granted on the usual conditions. The Secretary had reported the receipt from the widow of the late Colonel Picton Turbervill of a cheque for 50*l.* in respect of his contributions of 25*l.* per annum for the years 1890 and 1891. The Committee proposed to consider at a future meeting the purposes to which this grant could be most usefully applied. The Committee had considered the reference made to them at the last meeting of Council as to the continuance of the competitions for farms in the districts of the Society's Meetings. The whole question of farm competitions appeared to the Committee to require very careful consideration, and they had therefore ordered a memorandum on the subject prepared by the Secretary to be printed, with a view to their bringing up a final report after their next meeting.

Chemical.

Mr. WARREN presented the report of this Committee, dealing with various matters connected with the laboratory, and also the Committee's quarterly report. The report of the Woburn Sub-committee had been received and adopted.

On the motion of Mr. WARREN, the quarterly report of the Chemical Committee was adopted and ordered to be published in the next number of the Journal, together with the memorandum prepared for the information of the Departmental Committee on Fertilisers and Feeding Stuffs, upon the past action of the Society in regard to the repression of adulteration of manures and feeding stuffs (see page 347).

Seeds and Plant Diseases.

Mr. WHITEHEAD reported that the arrangements for the Society's potato experiments were progressing satisfactorily. The Stock Prizes Committee having approved of the schedule of prizes for jams, preserved fruits and vegetables, cider, and perry, proposed by this Committee, at their last meeting, for competition at the Chester Meeting of 1893, the conditions and regulations governing these prizes had been again considered and finally passed (see page lxxiv.). Miss Ormerod had presented her usual quarterly report, which the Committee recommended for publication with the proceedings of Council, and in the next number of the Journal (see page 365).

Mr. WHITEHEAD remarked that Miss Ormerod's report contained an account of an attack of pea beetles, which had done some considerable damage, and of the remedies which should be adopted. But the most unsatisfactory part of the report was the announcement of the reappearance of the diamond-back moth.

The Earl of RAVENSWORTH asked if there were any information as to whether the localities in which this destructive moth had re-appeared this year were the same as those of last year.

Mr. WHITEHEAD replied in the affirmative.

Veterinary.

Sir JOHN THOROLD (Chairman) stated that a report had been received from Mr. Edgar, F.R.C.V.S., the Society's provincial veterinary surgeon for the county of Kent, as to cases dealt with by him during the last year. Twenty-nine entries had been received for the horse-shoeing competition at Warwick—viz. twenty-two in Class I. (Roadsters) and seven in Class II. (Dray Horses). It was arranged that the competition in Class I. should be held on Tuesday and Wednesday, June 21 and 22, and in Class II. on Thursday, June 23. The Committee recommended that Professor Pritchard be asked to lecture on horse-shoeing, as last year, on Friday, June 24.

The following report had been received from Professor Brown:—

FOOT-AND-MOUTH DISEASE.—This disease still lingers in the Sittingbourne district of Kent, principally among sheep. It was hoped that the slaughter of about 200 sheep by the Board of Agriculture would have stamped it out, but unfortunately some further outbreaks have occurred within the last few days.

SWINE FEVER.—This disease is increasing, as is always the case about this season of the year; during the past four weeks the fresh outbreaks have averaged about sixty per week, as compared with fifty per week for the previous month or two.

PLEURO-PNEUMONIA.—Since the last meeting of the Veterinary Committee, there have only been two fresh outbreaks of this disease in Great Britain. One of these occurred in Leith and the other in London. This is the smallest number of outbreaks in any four weeks since the Pleuro-pneumonia Act of 1890 came into operation, and probably the smallest in any corresponding period since the disease was first introduced about fifty years ago.

ANTHRAX.—There have been twenty fresh outbreaks of this disease reported in Great Britain in four weeks. They occurred in the counties of Dorset, Gloucester, Herts, Lancaster, Norfolk, Northampton, Northumberland, Somerset, Westmoreland, Wilts, Worcester, and York (W.R.) in England; and Aberdeen, Forfar, and Ross in Scotland.

Stock Prizes.

Mr. SANDAY (Chairman) reported that the question as to the advisability of continuing classes for jams and preserved fruits, and cider and perry, at the Society's Meetings had been discussed, and finally it had been decided to recommend the continuance of the prizes for next year, and to refer back to the Seeds and Plants Committee, for further consideration, the conditions under which the jams and fruit were to be exhibited. The preliminary consider-

ation of the prize sheet for the Chester Meeting of 1893 had been proceeded with, and the Committee recommended that the schedule of prizes for live stock, as at present arranged, be printed for further consideration at the meeting of the Committee to be held on July 26.

A schedule of prizes for Cheese, Cider and Perry and Jams, &c., had been agreed to, and was recommended for adoption (see page lxxiv.).

Implement.

Mr. CRUTCHLEY reported that various letters from implement exhibitors as to further tickets required by them had been considered, but the Committee recommended that the Secretary be authorised to limit the issue of tickets to the number laid down in the regulations. Arrangements had been made for a field to be placed at the disposal of the Society, if necessary, for the purpose of exhibitions of steam digging during the period of the Warwick Meeting. The Committee recommended that prizes for sheep-shearing machines be offered in connection with the Chester Meeting.

General Warwick.

Mr. DENT reported that various applications from Mr. C. W. Wilson on behalf of pony breeders, from the National Sheep Breeders' Association, the British Berkshire Society, the Agricultural Exhibitors' Association, &c., for permission to hold meetings in the Showyard had been granted on the usual conditions. Letters had been received from the Tennis Court Club of Leamington, conferring the honorary membership of the club on the Members of Council during the period of the show, and from the Borough Club, Leamington, stating that the club would be open to exhibitors at the show as honorary members; and the Committee recommended that these invitations be acknowledged with the thanks of the Council. The Committee had considered the programme for the Warwick Meeting, which, with certain amendments, had been finally approved and ordered to be issued. The following time-table had been arranged for the meetings of the several societies that had requested permission to use the large tent during the show:—

Monday, June 20.	
Shropshire Sheep Breeders' Association	2 0 p.m.
Tuesday, June 21.	
Hunters' Improvement Society	11 0 a.m.
Royal Agricultural Society	12 30 p.m.
Shire Horse Society	2 0 p.m.
Shorthorn Society	2 30 p.m.
Hereford Herd Book Society	3 0 p.m.
British Berkshire Society	3 30 p.m.
Cotswold Sheep Society	4 0 p.m.
Wednesday, June 22.	
Pony Breeders	11 30 a.m.
National Sheep Breeders' Association	12 noon.
Agricultural Exhibitors' Association	3 0 p.m.

Showyard Works.

Sir JACOB WILSON reported that the implement yard at Warwick was completed, and that the exhibits were arriving daily. The whole of the stock yard was well in hand, and would all be completed in good time. Various accounts had been passed for payment. A letter dated May 26, 1892, had been read from the Agricultural Exhibitors' Association as to facilities and accommodation in the showyard, but its consideration was of necessity postponed until after the Show, in view of the late period at which it had been received. The Committee also recommended that the Surveyor be instructed to make arrangements in the large tent for the convenience of the meetings of more than one society held at or about the same time. The plan of the Chester Showyard had been provisionally considered and approved.

Selection.

Earl CATHCART, Chairman of the Committee of Selection, reported with regret the death of Dr. Hofmann, the distinguished German chemist, who had been an honorary member of the Society since the year 1846. With the exception of Sir Lyon Playfair, Dr. Hofmann was the oldest of the Society's honorary members.

Education.

Lord MORETON (Chairman) presented a detailed report (see page 353)

by the Education Committee on the results of the recent Senior Examination, from which it appeared that twenty-eight candidates entered, and twenty actually competed, at the examination which took place from May 10 to 14 last, and that of these twenty competitors ten satisfied the examiners. Communications had been received from the Charity Commissioners in respect of the administration of Read's Charity, Drax (Yorkshire), and Wye College (Kent) Foundations, together with copies of the draft schemes. The Committee would be prepared to nominate representative governors upon the foundations when the schemes had been finally settled. The Secretary had been authorised to make the usual arrangements for the holding of the Society's junior examinations on November 8 and 9 next.

Dairy.

Hon. CECIL T. PARKER (Chairman) reported the entries in the butter-making competitions. The Committee recommended that on Friday, June 24, a competition be held between the whole of the prize-winners in the four classes, and that a prize of 5*l.*, with the Society's silver medal, be awarded to the successful competitor. Copies were laid upon the table of a new and revised edition of the pamphlet on Cheshire cheese-making.

Steward of Forage for Chester Meeting of 1893.

Sir JACOB WILSON moved, Mr. SANDAY seconded, and it was unanimously resolved, that Mr. Alfred Ashworth, of Tabley Grange, Knutsford, be elected Steward of Forage for the Chester Meeting of 1893.

Suggestion at General Meeting.

The Council then considered the suggestion made by Mr. George Barham at the General Meeting on May 23—viz. "That the Society should subscribe to the Mansion House Association on Railway and Canal Traffic."

After remarks by Earl CATHCART, the Duke of RICHMOND AND GORDON, Mr. DENT, and the Earl of RAVENSWORTH, it was resolved that the answer of the Council should be: "That the Council, having fully considered the matter at their meeting on March 2 last, were unable to reopen the question."

Country Meeting of 1894.

The SECRETARY reported the receipt of various letters from the Cambridgeshire and Isle of Ely Agricultural Society, the St. Albans Farmers' Club, &c., in reference to proposals to invite the Society to hold its Country Meeting for 1894 at Cambridge and St. Albans.

Dates of future Meetings.

Various other matters having been dealt with, the Council adjourned till Wednesday, June 22, at 1 P.M., in the Showyard at Warwick, and it was at the same time arranged to have a daily meeting of the Council during the Show at 1 P.M.

CHESTER MEETING, 1893.

SCHEDULE OF PRIZES ALREADY SETTLED FOR CHEESE, CIDER AND PERRY, JAMS AND PRESERVED FRUITS, ETC.

CHEESE.

CHEESE OF THE CLASS USUALLY DENOMINATED CHESHIRE CHEESE.

(*Offered by the Chester Local Committee.*)

A CHAMPION PRIZE of £50 for the Three best Cheshire Cheeses in the Show.

[No Entry will be required for this Prize, as the Cheeses to which it will be awarded will be selected from those entered for Prizes in Classes 1, 2, and 3.]

No.	CLASS 1.—*Coloured or Uncoloured Cheese made in* 1892.	1st Prize. £	2nd Prize. £	3rd Prize. £	4th Prize. £
1	Three Cheeses not less than 60lb. weight each	20	15	10	5
2	Three Cheeses not less than 30lb. and under 60lb. weight each	20	15	10	5
	CLASS 2.—*Coloured Cheese made in* 1893.				
3	Three Cheeses not less than 60lb. weight each	20	15	10	5
4	Three Cheeses not less than 40lb. and under 60lb. weight each	20	15	10	5
5	Three Cheeses under 40lb. weight each	15	10	5	3
	CLASS 3.—*Uncoloured Cheese made in* 1893.				
6	Three Cheeses not less than 50lb. weight each	20	15	10	5
7	Three Cheeses under 50lb. weight each	20	15	10	5
8	Three Cheeses under 40lb. weight each	15	10	5	3

DAIRY MAIDS AND CHEESE MAKERS.

No.		£
1	To the Dairy Maid or Person who shall have made the Dairy of Cheeses winning the Champion Prize	10
2	To the Dairy Maid or Person who shall have made the Dairy of First Prize, No. 1	3
3	" " " " " " 2	3
4	" " " " " " 3	3
5	" " " " " " 4	3
6	" " " " " " 5	3
7	" " " " " " 6	3
8	" " " " " " 7	3
9	" " " " " " 8	3

(No Dairy Maid or Cheese Maker to take more than one Prize.)

CHEDDAR CHEESE.	Made in	1st £	2nd £	3rd £
Three Cheddar Cheeses	1892	10	5	3
Three Cheddar Cheeses	1893	10	5	3
STILTON CHEESE.				
Three Stilton Cheeses	1892	5	3	2
Three Stilton Cheeses	1893	5	3	2
OTHER VARIETIES OF CHEESE.				
Three Double Gloucester Cheeses	1893	5	3	2
Three Leicester Cheeses	1893	5	3	2
Three North Wilts Loaf Cheeses	1893	5	3	2
Three Lancashire Toasting Cheeses	1893	5	3	2
Three Cheeses, any other variety	1893	5	3	2

(The prizes for cheeses made in 1893 to be subject to future modification if found desirable.)

JAMS, AND PRESERVED FRUITS AND VEGETABLES

(all of 1892 growth.)

	£	£	£
Collection of Whole Fruit Jams	3	2	1
Collection of Bottled Fruits	3	2	1
Collection of Preserved Fruits for dessert purposes	3	2	1
Collection of Preserved Peas, French Beans, Tomatoes, and Mushrooms, for cooking purposes	3	2	1
Collection of Dried or Evaporated Fruits and Vegetables for cooking purposes	3	2	1

CIDER AND PERRY (to be made from fruit grown in 1892. Open to both makers and growers).

	£	£	£
Cask of not less than 18 and not more than 30 gallons of Cider made in the autumn of 1892	5	3	2
Twelve bottles of Cider made in the autumn of 1892	5	3	2
Twelve bottles of Cider made in any year before 1892	5	3	2
Twelve bottles of Perry	5	3	2

Proceedings at 53rd Anniversary Meeting of Governors and Members.

HELD IN THE HALL OF THE ROYAL MEDICAL AND CHIRURGICAL SOCIETY, 20 HANOVER SQUARE.

MONDAY, MAY 23, 1892.

THE EARL OF FEVERSHAM (PRESIDENT) IN THE CHAIR.

Present:—

Members of Council.—The Duke of Westminster, K.G., the Earl of Ravensworth, General Viscount Bridport, G.C.B., Lord Brougham and Vaux, Lord Moreton, Sir Massey Lopes, Bart., Sir Matthew White Ridley, Bart., M.P., Colonel Sir Nigel Kingscote, K.C.B., Mr. G. Mander Allender, Mr. Percy E. Crutchley, Mr. John Dent Dent, Mr. James Hornsby, Mr. T. H. Miller, Mr. Henry Smith, Mr. E. W. Stanyforth, Mr. John Tremayne, Mr. Charles Whitehead, and Mr. Christopher W. Wilson.

Governor.—The Earl of Powis.

Members.—The Earl of Belmore, the Rev. Viscount Molesworth, the Hon. Alexander Campbell, Vice-Admiral the Hon. W. C. Carpenter, the Hon. Atholl Liddell, the Hon. W. Vernon, Sir William Vincent, Bart., Sir Henry Simpson, Messrs. Arthur Arkwright, Arthur S. Barham, George Barham, G. Titus Barham, John Beaulah, Wentworth C. B. Beaumont, Horace F. Cox, Joseph Darby, W. Duncombe, Thomas Dunn, John R. Eve, John T. Frere, H. F. Getting, J. C. Getting, H. J. Greenwood, Surgeon-Lieut.-Col. Ince, M.D., Messrs. Frederick King, Granville E. Leveson-Gower, Alexander Macdonald, Henry F. Moore, Gilbert Murray, A. W. Perkin, Claude M. S. Pilkington, R. Henry Rew, Hugh Roger, Harold Sessions, G. F. Sheppard, Pinder Simpson, G. Smythies, J. Herbert Taylor, F. J. Thynne, R. Wallace, R. W. Welborn, G. D. Yeoman, &c.

Officers.—Mr. Ernest Clarke, Secretary and Editor; Dr. J. Augustus Voelcker, Consulting Chemist.

The SECRETARY having read the Bye-Law governing the transaction of business at the anniversary meetings, the Hon. ATHOLL LIDDELL said he had great pleasure in moving "That His Grace the Duke of Westminster, K.G., be elected President of the Society for the year ensuing the Warwick Meeting."

Sir HENRY SIMPSON seconded, saying that his Grace was so well known for his exertions in the cause of agriculture and horse-breeding—in fact, for everything that promoted the good of the country—that he felt sure the resolution would be received with that cordiality which it deserved.

The motion having been carried by acclamation,

The Duke of WESTMINSTER said he was extremely obliged for the honour which had been conferred upon him in his election as President of the Society. It could not be for past services, but chiefly on account of their having decided on Chester as the place of Meeting for next year. Nothing should be wanting on his part to make that Meeting as successful as they hoped it would be. Sir Henry Simpson had alluded to his efforts in the department of horse-breeding, which, he was bound to say, had chiefly been in the direction of thoroughbred horse-breeding, and with partial success. He only regretted that his efforts in the direction of Shire horse-breeding had been thoroughly unsuccessful,

inasmuch as he had been attended with as much bad luck with Shire horses as he had been attended with good luck in the other direction. Sometimes, however, things changed, and, in this respect, he hoped his efforts might be of more use. He thanked them very much, and would only repeat that he should be very happy to act as President for the ensuing year. (Cheers.)

The Trustees and Vice-Presidents having been re-elected by show of hands, the election of twenty-five Members of Council was proceeded with, and the PRESIDENT appointed Mr. J. Herbert Taylor, Professor Wallace, and Mr. G. D. Yeoman to act as scrutineers of the voting-papers. These having been duly collected and the report of the scrutineers thereon received, it was announced that the twenty-five Members of Council who retired by rotation had been re-elected.

The SECRETARY having read the Report of the Council to the Meeting (see page 339),

Mr. GILBERT MURRAY, in moving its adoption, said the Report seemed to him to be a very satisfactory one. The action taken by the Board of Agriculture in freeing the country from disease was most satisfactory. He thought that very few persons could remember the country so free from disease as at the present moment. Not less satisfactory was the action taken by the Society with regard to technical education. This, to his mind, was one of the most important things at the present day. He would have been very glad if, from the commencement of tho movement, the different County Councils throughout the country could have had some instructions issued to them either from the Society or the Board of Agriculture. Everybody seemed to be at sea, and no two counties were acting upon the same lines. He had had considerable experience in a good many of the counties, and had taken much interest in the matter. He found that Cheshire was ahead of any other county in regard to technical education. They had taken a distinct and clear course, which he thought other counties ought to follow. He did not believe in beginning with professors. He believed in beginning with the schoolmaster. He thought they wanted to teach the rudiments and to begin in the elementary schools. He was not very much interested in the towns, which he thought could very well take care of themselves. He was more interested in the technical education of the country, where he should like to see the subject taken up. Very much more might be done. The schoolmasters were ignorant of the whole matter, but they might be teaching themselves and their pupils at the same time. With regard to peripatetic lectures, the older farmers would not come down to them. It was the young men who did so, and they must begin with these and follow it up. He wished that every county might have centres for farm classes. He had much pleasure in moving the adoption of the Report.

Mr. ARTHUR ARKWRIGHT seconded the motion.

Surgeon-Lieut.-Col. INCE, M.D., supported the motion. He regarded the publication of the Society's text-book as a splendid step in the progress of education. But their Society was a long way from where it ought to be in improving the practical education of this country. He hoped the time would shortly arrive when the Society would be able to recruit from a larger field than it did at present. Dr. Ince also argued at some length against the possibility of ever "stamping out" the contagious diseases of animals.

Sir HENRY SIMPSON, referring to the discontinuance of the Society's grant of 600*l.* to the Royal Commission on Horse-Breeding, said that he, in common with other members of the Society, dissented from this decision of the Council. He quite agreed that the horse-breeding interest was much indebted to the Society for what they had done in regard to the grant, and no doubt the initiative taken by the Society had been the means of inducing the Government to grant the annual sum of 5,000*l.* He had, however, always looked upon the amount granted by the Government as a preliminary donation, and he had looked forward to the time when that donation might be increased. He should have been glad to see the Society continue their grant of 600*l.*,

and was sorry the Council had decided to discontinue it. He trusted, in any event, that the grant withdrawn by the Society would be replaced by an augmented grant by the Government.

The Duke of WESTMINSTER said there was no doubt the exertions of the Society had been most valuable with regard to the suppression of disease. He thought some special reference ought to be made to the exertions, and to the zeal and capacity which had distinguished the head of the Board of Agriculture in this direction. He thought it must be admitted that it was that zeal and energy, and the effectual measures carried out, which had contributed very materially to the satisfactory prevention of the spread of disease. The country owed a great deal to the Department of State which had to deal with the contagious diseases of animals.

The motion for the adoption of the Report was then put, and carried unanimously.

In response to the usual inquiry from the Chair as to whether any Governor or Member had any remark to make, or suggestion to offer, that might be referred to the Council for consideration,

Mr. GEORGE BARHAM suggested that the Society should subscribe to the Mansion House Association on Railway and Canal Traffic. As a member of the Association he could testify to the great labour and amount of work which it had performed, and to the heavy expenses incurred. The railway companies had expended over 100,000*l.* before the inquiry of the Board of Trade and Joint Parliamentary Committee, whilst the Mansion House Association had spent something like 10,000*l.* in combating their rates. The great and important agricultural interest had contributed, over a period of about three years, the large sum of 200*l.*! He thought, therefore, that they had had more than value for their money. With regard to one industry alone—that of milk sent from the country into the large towns—he might tell them that, if the terms proposed by the Board of Trade had been accepted, they would have had to pay 100,000*l.* a year more than under the present rates secured by the Mansion House Association. After relating the number of Acts which formerly were in existence for each railway company, but which were now reduced to one Act for each company, he referred to what was to him the most painful part of the matter. He believed that the Society's representatives upon the Mansion House Committee had proposed that the sum of 10*l.* 10*s.* per annum should be voted to the Mansion House Association. That resolution was opposed in the Council by his Grace the Duke of Richmond. He thought it exceedingly unfortunate that his Grace, occupying the position of Chairman of the Joint Committee on Railway Rates, but representing on the Council the agriculturists of the Kingdom, should have come to the Council and opposed the granting of the very paltry sum of 10*l.* 10*s.* per annum.

Sir NIGEL KINGSCOTE interposed, saying that of his certain knowledge the Duke was not Chairman of the Joint Committee at the time of the Council's resolution on the subject of the annual grant.

Mr. BARHAM, continuing, said he did not think he was subject to correction when he said that the Joint Committee had not yet concluded its labours; there was still a very important matter to come before it in connection with Canal Traffic. He was told that, by the great majority of the Acts, manures were carried free of toll. In many of the Acts, road materials also were carried free of toll. This was a very important matter when farms were so highly rated for keeping roads in repair. These were things as to which agriculturists should be represented before the Joint Committee now sitting, or how would they get fair play? After alluding to the connection of the railway companies with the Canals, Mr. Barham concluded by citing some of the objects of the Mansion House Association as bearing upon agricultural interests, and by insisting upon the importance of the Royal Agricultural Society's co-operation therein by an annual subscription to the funds of the Association.

The Earl of RAVENSWORTH, referring to the laborious services of the Duke of Richmond as Chairman for

two years in succession of the Joint Parliamentary Committee on Railway Rates, said that the thanks of the community were due to his Grace for having undertaken such an office at all; and they had no business or right to question the reasons which had induced him to take the course he did in the Council of this Society. He was quite sure the noble Duke had very good reasons for what he had done, and was perfectly able to defend himself. He thought it only due to the Duke that some remark should be made as to the value of his services in presiding over so difficult and technical a Committee.

The Earl of BELMORE remarked that he knew as a matter of fact that the Duke of Richmond's duties as Chairman of the Committee last year came to an end in July. The Committee was reappointed this year, but was not constituted exactly as before. Last year, he (Lord Belmore) was upon the Committee; this year he was not. The Committee of last year had finally reported, and was not now sitting.

Mr. BARHAM withdrew the statement which he had made in reference to the Duke of Richmond's Chairmanship of the Joint Committee, and the subject then dropped.

No other member desiring to offer any remarks, Sir WILLIAM VINCENT moved a hearty vote of thanks to the noble President for presiding over the meeting that day. His Lordship had rendered such distinguished services in the cause of agriculture, and had shown such great interest in, and devoted himself so much to the work of the Society, that he was quite sure that upon these two grounds the vote of thanks would be given with great cordiality.

Mr. R. HENRY REW seconded, and the motion having been carried by acclamation,

The PRESIDENT, in reply, thanked the meeting extremely for the kind manner in which the motion had been received. It had afforded him satisfaction to have had the honour of presiding over that meeting as President of the Royal Agricultural Society. He wished, before he sat down, to cordially endorse the views which had been expressed by the noble Duke with regard to the action of the Board of Agriculture in the suppression of cattle disease in the country. He, as a breeder of shorthorns, felt that his acknowledgments, and the acknowledgments of all those connected with the breeding of cattle, were certainly due for the very successful action which Mr. Chaplin, as President of the Board, had taken for the suppression of cattle disease, especially since the outbreak of foot-and-mouth disease. He thought that the reference in the Report did not go beyond the facts of the case. He hoped that the result of the energy and zeal of the President of the Board of Agriculture would bear good fruit, and that before long the country would be relieved from the horrible disease of foot-and-mouth. Of course, he quite concurred in the importance of the subject of railway rates. He quite agreed with his noble friend Lord Ravensworth that his Grace the Duke of Richmond had only acted upon the highest motives. He (the President) was one of those who differed from him. He confessed he did not see any objection to subscribing a sum to the Mansion House Association; but, of course, that subject would be considered, as well as any other suggestions which had been made that day by the Council. He thought he might congratulate them upon the general position of the Society. He had no doubt it was doing a great and successful work. British agriculture at that moment did require, no doubt, every assistance which that or any other Society could afford it. He thought they might say that the agriculturists of this country were appreciating the work of the Society, since they had a satisfactory increase in the number of members, as their Report showed. Their great Show, which was to take place next month, might be regarded indeed as a school of agriculture in itself. And the quarterly numbers of their Journal deserved to be studied by every British farmer. He was convinced that if the farmers of this country studied the information which their Journal was designed and intended to give, great advantage and benefit would result from the operation of the Society.

The proceedings then terminated.

ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

Proceedings of the Council.

WEDNESDAY, JUNE 22, 1892

(IN THE SHOWYARD AT WARWICK).

THE EARL OF FEVERSHAM (PRESIDENT) IN THE CHAIR.

Present:—

Vice-Presidents.—H.R.H. Prince Christian, K.G., Lord Moreton, Sir John Thorold, Bart.

Other Members of Council.—Mr. Alfred Ashworth, Mr. Joseph Beach, Mr. J. Bowen-Jones, Mr. Charles Clay, the Earl of Coventry, Mr. Percy E. Crutchley, Lieut.-Col. J. F. Curtis-Hayward, Mr. J. Marshall Dugdale, Mr. W. Frankish, Mr. A. Hamond, Mr. Charles Howard, Mr. C. S. Mainwaring, Mr. P. A. Muntz, M.P., Mr. Albert Pell, Mr. J. E. Ransome, Mr. G. H. Sanday, Mr. W. T. Scarth, Mr. A. J. Smith, Mr. Henry Smith, Sir Joseph Spearman, Bart., Mr. E. W. Stanyforth, Mr. Martin J. Sutton, Mr. Garrett Taylor, Mr. Joseph P. Terry, the Duke of Westminster, K.G., Mr. C. W. Wilson, Sir Jacob Wilson.

Professor Brown, C.B.

Governor.—Mr. A. B. Freeman-Mitford, C.B.

Officers.—Mr. Ernest Clarke, Secretary and Editor; Dr. J. Augustus Voelcker, Consulting Chemist.

The following members of the Warwick Local Committee were also present: Lord Leigh (Chairman), Mr. F. H. Moore (Local Secretary).

The minutes of the last monthly meeting of the Council, held on June 1, were approved, as were also the minutes of the special Council meeting held in the Showyard on Monday, June 20. The latter dealt with various details connected with the Warwick Meeting, including the granting of permission to the Southdown Sheep Association and to breeders of turkeys to hold meetings in the large tent; the arrangements for the exhibition of steam digging; and various applications for readmission to the Showyard without payment, which were not granted, as contrary to the Society's regulations.

Election of New Members.

The election of the following fifty-four new members was then proceeded with:—

Allix, C. P.. Swaffham Prior Ho., Cambridge.
Arabin, W. St. J... Portswood, Southampton.
Ashwin, J... Bretforton, Evesham.
Ashwin, M. C... Stratford-on-Avou.
Bathurst, The Hon. A. B... Cirencester House.
Berry, G... 133 Market Place, Cirencester.
Bickerton, J. S... Sandford Hall, Oswestry.
Brown, W... St. Mary's Road, Leamington.
Browne, T. W... Haughton, Shifnal.
Burrow, R. E... Swinfen, Lichfield.
Burrows, A. J... Pluckley, Ashford.
Callwood, A... Allen's Cross, Northfield, Birmingham.
Cazenove, W. de P... Cranbourne, Salisbury.
Clifford, G.. Stoneyhurst, Christchurch, N.Z.
Constable, S. N... Stonings, Knockholt, Sevenoaks.
Crofts, W. T... Stretton-under-Fosse, Rugby.
Dangar, F. H... Lyndhurst, Cleveland Road, Ealing.
Darlington, J... Stanwardine Farm, Baschurch, Salop.
Dugdale, Col. H. C. G... Blyth Hall, Coleshill.
Edwards, J... Pencelly Court, Brecon.
Gibson, W... Groby Lodge, Groby, Leicester.
Gilliland, G. K... Brook Hall, Londonderry.

GRAHAM, Maj.-Gen. G. Fergus..Hardingstone, Northamptonshire.
GREVILLE, Hon. Alwyu H. F...4 Upper Brook Street, W.
GREVILLE, Hon. L. G...35 Berkeley Square, W.
HIGGS, G...11 St. John's Street, Stamford.
HOLLAND, Hon. S...44 Bryanston Square, W.
HUTCHINSON, J...Binchester Cragg, Wellington, Durham.
INGHAM, Walter..Churchwell, Leeds.
JENNINGS, A...Minworth, Birmingham.
JONES, J. T...Tynllyne, Llanigon, Brecon.
LANGRIDGE, L...Banstead, Epsom.
LEWIS, E...Tregirog Farm, Monmouth.
MALLABEY, S...Grendon, Atherstone.
MELLES, J. W...Sewardstone Lodge, Chingford, Essex.
NOAKES, H...Burr's Hill, Brenchley, Kent.
OWENS, W...Jamesford, Montgomery.
RAMPLY, J...Church Farm, Southoe, Hunts.
RASH, J. J...New Waters, Wortham, Diss.
RINGROSE, Captain G. H...Whittlebury, Towcester.
SALMON, T...Waverton, Chester.
SALWEY, A...Overton, Ludlow.
SMITH, T. H...Atherston-on-Stour.
SNOWDON, B. J...Bracks Farm, Bp. Auckland.
SPILMAN, A. A...Burringham, Doncaster.
SWINFEN-BROUN, Maj. M. A...Swinfen Hall, Lichfield.
THOMAS, W...Seamer Hill, Yarm, Yorks.
WALTON, W. H. M...Sherborne, Northleach.
WATSON, George L...Rockingham Castle, Uppingham.
WEYMOUTH, Viscount ..Longleat, Warminster.
WILCOX, C. W...Wolston Manor, Coventry.
WISE, H. E. D...Walton Hall, Burton-on-Trent.
WOOD, T. B...North Elmham, E. Dereham.
WOODBURN, W...Colne Cottage, Market Drayton.

Reports from Committees.

Formal reports from the Finance, Implement, and Showyard Works Committees were presented by Sir JOHN THOROLD, Mr. FRANKISH, and Sir JACOB WILSON, and were unanimously adopted.

Veterinary Inspection.

Professor BROWN presented the following report upon the results of the veterinary inspection of stallions and brood mares under regulation 44 :

Report of the Examination of Horses for Soundness.

The Judges of the various classes of horses selected and sent out ninety-six horses for examination. Of these eighty-three were passed sound and thirteen were rejected as unsound.

The diseases which were detected were cataract, roaring, ringbone, sidebone, spavin, and unsound feet.

Of the thirteen disqualified horses seven were affected with spavin, one with ringbone, two with sidebone, one with cataract, one was a roarer, three horses had unsound feet, and two of these also had spavins.

The disqualified horses belonged chiefly to the lighter breeds; nine of them were entered in Classes 1 to 18, while four belonged to the agricultural horses, Shires, Clydesdales, and Suffolks.

The accompanying list gives the number of horses examined in the different classes and also the result of the examinations in each class.

Class		
1	6 examined	1 cataract.
9	6 ,,	all sound.
10	4 whole class	1 unsound feet.
11	4 examined	1 unsound feet and spavin.
12	6 ,,	1 spavin.
13	6 ,,	1 spavin.
14	5 ,,	1 sidebone.
17	5 ,,	1 spavin.
18	6 ,,	1 spavin. 1 spavin and unsound feet.
23	7 ,,	1 sidebone. 1 roaring.
24	7 ,,	all passed.
25	7 ,,	1 spavin.
26	7 ,,	all passed.
30	4 ,,	,,
31	3 ,,	,,
35	5 ,,	,,
36	4 ,,	,,
37	2 ,,	1 ringbone.
38	1 ,,	passed.
39	1 ,,	,,

(Signed) G. T. BROWN.
June 20, 1892.

Chester Meeting of 1893.

A General Chester Committee was appointed, to consist of the whole Council, with six representatives to be nominated by the Local Committee, the Committee to sit for the first time on Wednesday, July 27.

Country Meeting of 1894.

The SECRETARY reported the receipt of letters (1) from the Town Clerk of Cambridge, stating that the Market Committee of the Town Council had decided that it was desirable to ask the Royal Agricultural Society to hold their Show there in 1894; (2)

from the Cambridgeshire and Isle of Ely Agricultural Society, stating that a general meeting, convened by the Mayor of Cambridge, would be held on Saturday, the 25th June, to consider the matter; and (3) from the Town Clerk of St. Albans, formally inviting the Society to hold the Show of 1894 in that city. The thanks of the Council were ordered to be sent for these communications, which were reserved for further consideration after the autumn recess.

Votes of Thanks in connection with the Warwick Meeting.

On the motion of Sir JACOB WILSON (Honorary Director), seconded by Mr. C. S. MAINWARING (Senior Steward of Stock), it was unanimously resolved:—

(1) That the best thanks of the Society are due and are hereby tendered to—

(*a*) Lloyd's Bank, Limited (the Local Bankers of the Society) and the County Police, for the efficient assistance rendered by them during the Warwick Meeting.

(*b*) To the Great Western and London and North Western Railway Companies, for the facilities afforded by them in connection with the Meeting.

(*c*) To the St. John's Ambulance Association, for the ambulance arrangements in the Showyard.

(*d*) To the National Telephone Company, Limited, for their efficient arrangements in connecting the Showyard with the Company's system throughout the country, and for providing telephonic communication between the Society's offices within the Showyard.

(*e*) To Messrs. Plucknett and Co., for furnishing the Royal Pavilion.

(*f*) To Messrs. Merryweather and Sons, for the arrangements made for the prevention of fire, and for the loan of fire appliances in the Showyard.

(2) That a letter be addressed to the Home Secretary after the conclusion of the Meeting, conveying the appreciation of the Council of the very efficient services rendered by the A Division of the Metropolitan Police at the Warwick Meeting.

Suggestions made at General Meeting.

The suggestions made at the general meeting, held in the Showyard on the previous day, by Mr. Saltmarshe as to reduction of the Society's analytical fees for feeding-stuffs, and by Mr. Fawcett as to the extension of the chemical privileges to merchants and traders as well as to farmers, were referred to the Chemical Committee for consideration and report.

Preparation of Poultry for Market.

Mr. PELL, in drawing attention to this subject, said it was a very important thing that poultry should be prepared on the farm in a way fit to go into a gentleman's house, without the intervention of the poulterer in London. He therefore gave notice of a motion:—"That the Council should consider the question of trussing and preparing dead poultry for market, with the view of prizes being awarded for proficiency at the Chester Meeting."

After a short discussion it was decided that the question should be referred to the Stock Prizes Committee.

Docking of Foals' Tails.

The Duke of WESTMINSTER gave notice of the following motion:—"That in future no foals with docked tails should be entered for the Society's Country Meetings." He said it was rather cruel to dock the tails of young foals which spent a couple of years at grass, as they had no means of keeping off flies.

Mr. GARRETT TAYLOR said there was now considerable difficulty in their being allowed to do anything in the way of marking or docking horses. Even marking sheep was considered to be a cruelty. If foals or horses were to be docked at all, there was less cruelty in doing so whilst they were young, and they were then also less likely to be taken notice of. Those breeds which were valuable generally found some shelter.

Mr. MUNTZ, M.P., said if animals were docked at all, it should be done whilst they were foals.

The Earl of COVENTRY said it was very cruel to dock foals. For two or three summers they were at grass,

and without tails had no protection against flies.

H.R.H. Prince CHRISTIAN raised the question of the necessity of docking horses' tails at all. He thought it excessively ugly.

Date of Next Meeting.

Various letters and other documents having been laid upon the table, the Council adjourned until Wednesday, July 27 next.

Special Meetings of Council.

THURSDAY, JUNE 23, 1892.

A special meeting of the Council was held on Thursday, June 23, Lord Moreton (Vice-President) in the chair. At this meeting a letter dated June 22 was read from the Judges of miscellaneous implements, stating that in the case of the two most important classes of new implements brought under their notice, viz., petroleum engines and "hay-kickers," they were unable to consider an award without a trial, which it was impossible to carry out without preliminary preparation. They therefore suggested that the question of competitive trials of these two classes of machines should be considered by the Council.

Mr. CRUTCHLEY remarked that after the delivery to the Stewards of this report, a letter had been received from one of the firms exhibiting petroleum engines asking, in view of the relative importance of their entry as compared with those exhibits to which silver medals had been awarded, for the award of a silver medal to their machine, which was an absolutely new implement.

Mr. FRANKISH pointed out that only two years ago the Society had had a competition of oil engines at its Plymouth Meeting. They were already committed to an expensive competitive trial of sheaf-binders in connection with the Chester Meeting, and there would also be a trial of sheep-shearing machines. He thought therefore, that they could not undertake another trial of oil engines next year, though, perhaps, the matter might be considered for the Meeting in 1894. As to hay-kickers, a trial of these might perhaps be arranged for next year, if the Council thought it expedient.

The discussion was continued by Mr. ROWLANDSON, Sir JACOB WILSON, Mr. SANDAY, and others, and eventually the report of the Judges was referred to the Implement Committee for consideration and report.

Inquiries were directed to be made of the exhibitors as to two cases of alleged ineligibility of animals to which prizes had been awarded, and the Council then adjourned.

FRIDAY, JUNE 24, 1892.

A special meeting of the Council was also held on Friday, June 24, Lord Moreton (Vice-President) in the chair, when various matters of detail were arranged, and, on the motion of Mr. MAINWARING (Steward of Horses), seconded by Mr. WHEELER (Steward of Sheep), a cordial vote of thanks was passed to Major Fosbery for the very efficient arrangements made by him as Steward of Forage for the Warwick Meeting.

Major FOSBERY, who was present, briefly returned thanks, and the Council then adjourned until Wednesday, July 27, 1892.

WEDNESDAY, JULY 27, 1892,

THE EARL OF FEVERSHAM (EX-PRESIDENT) IN THE CHAIR.

Present:—

Trustees.—Earl Cathcart, Mr. John Dent Dent, Lord Egerton of Tatton, Col. Sir Nigel Kingscote, K.C.B.

Vice-Presidents.—Viscount Emlyn, the Earl of Feversham, Mr. Walter Gilbey, Right Hon. Sir Massey Lopes, Bart., Lord Moreton, Sir J. H. Thorold, Bart., Mr. Charles Whitehead.

Other Members of Council.—Mr. G. M. Allender, Mr. J. Bowen-Jones, Lord Brougham and Vaux, Mr. Percy E. Crutchley, Lieut.-Col. J. F. Curtis-Hayward, Mr. J. Marshall Dugdale, Mr. W. Frankish, Mr. Hugh Gorringe, Mr. Charles Howard, Mr. C. S. Mainwaring, Mr. Joseph Martin, Mr. T. H. Miller, Hon. Cecil T. Parker, Mr. J. E. Ransome, Mr. James Rawlence, Mr. Dan. Pidgeon, Mr. Samuel Rowlandson, Mr. G. H. Sanday, Mr. A. J. Smith, Mr. Henry Smith, Mr. E. W. Stanyforth, Mr. Garrett Taylor, Mr. J. P. Terry, Mr. John Tremayne, Mr. R. A. Warren, Mr. C. W. Wilson, Sir Jacob Wilson.

Officers.—Mr. Ernest Clarke, Secretary and Editor; Dr. J. Augustus Voelcker, Consulting Chemist; Professor J. B. Simonds, Consulting Veterinary Surgeon; Mr. Wilson Bennison, Surveyor.

Professor Brown, C.B.

The following members of the Chester Local Committee were also present:—The Mayor of Chester (Mr. Charles Brown), Mr. J. Matthews Jones (City Surveyor), Mr. John Scovell, Mr. W. Peers, and Mr. G. A. Dickson (Hon. Secretary).

Apologies for Non-attendance.

Apologies for non-attendance were received from H.R.H. Prince Christian of Schleswig-Holstein, K.G., the Duke of Westminster, K.G. (President), the Earl of Coventry, Mr. Arkwright, Mr. Ashworth, Mr. Chandos-Pole-Gell, Mr. Clay, Mr. Darby, Mr. Hornsby, Mr. Pell, and Mr. Stratton.

In the unavoidable absence of the President, the Earl of Feversham (ex-President) was called to the Chair.

Election of New Governors and Members.

The minutes of the last ordinary Council meeting, held on June 22, having been approved, and those of the special Council meetings, held in the Showyard on June 23 and 24, having been confirmed, the election of the following three Governors and sixty-eight Members was then proceeded with:—

Governors.

Barnard, Lord..Raby Castle, Darlington.
Blyth, James..Wood House, Stansted.
Turbervill, Col. J. P...Laleston House, Bridgend.

Members.

Aldred, Bold..Stamford Road, Altrincham.
Ashwell, Rev. S...Finmere Rectory, Oxon.
Bailey, J...Quendon Hall, Newport, Essex.
Barker, T...Plas Gogarth, Llandudno.
Beck, F. B...Sandringham, Norfolk.
Bilbie, John..Gold Hill, Southwell.
Booth, H..Handforth, Cheshire.
Brocklesby, John..Woottou, Lincoln.
Brown, Henry..Eldon House, Leeds.
Campbell, J. F...Aston Somerville, Glos.
Davidson, H. A...Haigh, Wigan.
Deacon, T. H...Swindon.
Deed, Percy..33, Carholme Road, Lincoln.
Dew, W. A...Wellfield, Bangor.
Downes, R...Mount Pleasant Ho., Redditch.
Dunnell, A. J...Wardington, Banbury.
Eadie, I. T. C...Barrow Hall, Derby.
Ebbetts, Elmer..61, High Street, Rochester.
Eddy, John..Kenford, Exeter.
Fellows, Wm. T. E..Minworth, Birmingham
Giles, W. B...Newport House, Eardisley.
Goddard, E..3, Bromley Terrace, Cirencester.
Gordon, H. P...Loudwater House, Rickmansworth.
Gossling, D. G...Eaton, Congleton.
[1] Gould, James..Foxley Hall Farm, Lymm.
Gregson, G. E...11, Chapel Street, Preston.
[1] Haffenden, Rev. J. W...Glovers Road Birmingham.
Hammerton, C...Stockwell, Surrey.
Harrison, Wm...Wilstrop Hall, Green Hammerton, York.
Hay, A. S...Marlefield, Roxburgh, N.B.
Heywood, N. A...Sudbourne Hall, Wickham Market.

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[1] Reinstated under Bye-law 12.

HODGSON, Wm...33, Wheelgate, Malton.
HOLT, James, Lea Marston, Birmingham.
HOLTHAM, G...18, Berkeley Street, Glos.
HORTON, T...Moseley, Birmingham.
JENKINS, Wm. H. P...Upton House, Banbury.
JOHNSTON, R. F...Northfield, Coldingham.
KENT, B. T...Little Abington, Cambridge.
LECHE, J. H...Carden Park, Chester.
LECHE, J. H., junr...Cheswardine, Market Drayton.
LEE, Charles..Rutland House, Leamington.
LOWE, J. H...Greenway Head, Tenbury.
LUCAS, M. P...The Oaks, Leamington.
MCKEAN, Beverley..New Park, Hertford.
MARKHAM, A. B...Baggrave Hall, Leicester.
MARSLAND, S. Kereheval..Newark.
MINSHULL, Wm. Poulton..Pulford, Wrexham.
NORBURY, T...Ashley, Altrincham.
O'BRIEN, Edward..Kendal, Westmoreland.
OWEN, Brigade Surg...Oteley Ho., Wrexham.
QUICK, F. J...New University Club, S.W.
REYNOLDS, T. H...Whilton Wharf, Daventry.
ROGERS, W. J...Clifton, Bristol.
RYDER, E. A. D...Kemble, Cirencester.
SAWLE, Sir Charles, Bt...Penrice, St. Austell.
SHOWELL, C...Snitterfield, Stratford-on-Avon.
SHOWELL, H..Hill Ho., Playford, Ipswich.
SKIPWITH, Gerald...Riseholme, Lincoln.
STEVENS, J. W...The Oaks, Horley, Surrey.
STUBS, P..Blaisdon Hall, Newnham-on-Severn.
TWYFORD, T. W...Biddulph, Congleton.
WALCOT, R. H...Bitterley, Ludlow.
WALLEY, S...Waverton, Chester.
WARD, J. W...Withcall, Louth.
[1] WILSON, J. W...Broadway, Worcestershire.
WOOD, Capt. C. E. W...Bishton Hall, Stafford.
WOOD, E. J. W...Meece House, Stone, Staffs.
WYCHERLEY, J. H...Market Drayton.

The reports of the several Standing Committees were then presented and adopted, as below:—

Finance.

Sir NIGEL KINGSCOTE (Chairman) reported that the accounts for the month ended June 30, 1892, as certified by the Society's Accountants, showed receipts amounting to 2,118*l.* 12*s.* 7*d.*, and expenditure to 6,462*l.* 3*s.* 7*d.* The balance at the Bankers on June 30, allowing for cheques outstanding, was 2,638*l.* 2*s.* 2*d.* The accounts for the period ended July 23, 1892, were also presented. They showed receipts amounting to 9,736*l.* 10*s.* 10*d.*, and expenditure to 1,724*l.* 18*s.* 2*d.*, with a balance at the Bank, allowing for cheques outstanding, of 10,749*l.* 14*s.* 10*d.* Accounts relating to the Warwick Meeting amounting in all to 9,641*l.* 10*s.* 1*d.*, and relating to the ordinary business of the Society amounting to 2,577*l.* 13*s.*, had been passed, and were submitted for payment. The quarterly statement of subscriptions and arrears, and of the Society's property, was laid upon the table.

[1] Reinstated under Bye-law 12.

On the motion of Sir NIGEL KINGSCOTE, it was unanimously resolved:—

> That, in view of the desirableness of winding up the accounts of the Warwick Meeting as early as possible, authority be given to the President, the Chairman of the Finance Committee, and the Secretary, to issue during the recess orders on the Society's Bankers for the payment of accounts connected with the Meeting, such accounts to have been previously submitted to and passed by a Steward of Finance.

Journal.

Earl CATHCART (Chairman) reported that Part II. of the current volume of the Journal was published on June 30, and issued to members immediately thereafter. An application from Dr. Fleming for permission to reprint Professor Brown's article on Contagious Foot-rot in Sheep had been granted on the usual conditions. The Committee agreed in the recommendations of the Veterinary Committee as to a reprint of this article, with additions, as a sixpenny pamphlet. The Committee had approved of the granting of certificates to twelve farm servants, nominated by the Judges of farms at Warwick, for distinguished merit in the discharge of their duties on the competing farms, and they recommended that each certificate be accompanied by a gratuity of one sovereign. The general question of the continuance of Farm Prize Competitions had been considered, and the Committee were of opinion that as these competitions had during the last twenty-two years been virtually extended all over England and Wales, it was desirable that they should now cease. They recommended, however, that a Commissioner or Commissioners be appointed and paid by the Society to visit typical farms of different descriptions in the district in which the country meeting was to be held, such farms to be selected by the Local Committee, and submitted for the approval of the Council. Various suggestions for articles and notes in the Journal had been considered, and the arrangements for the next number of the Journal settled. The thanks of

the Society were recommended to be sent for copies of Greek agricultural publications, and for a copy of the late Lord Powis's speeches and articles.

Farm Prize Competitions.

Earl CATHCART, in reference to the Committee's recommendation on the subject of farm prizes, said their decision had been due to no lack of appreciation of the offer of the Local Committee, to whom they felt exceedingly obliged. But they thought the time was come when they should give up the system of farm competitions. It was considered that it would answer better, both for the interests of the neighbourhood and also for the purposes of the Journal, if, instead of having a competition, they were to send a Commissioner or Commissioners to visit typical farms in the district.

Mr. GARRETT TAYLOR asked whether any suggestion had been made with respect to a diploma or certificate of merit of any kind to be given to those farms which were to be visited, as proposed by the Committee.

Lord EGERTON of TATTON said that the discontinuance of the Farm Prize Competitions would be a very great disappointment to the farmers in Cheshire, many of whom had spent money and made arrangements for competing. The Farm Prize Competitions of the Society, as well as those of the Royal Manchester Society, had been a great stimulus to the farmers of the district. Competition for prizes of this kind stimulated them to keep their farms in a tidy state. He quite understood that there was now no necessity for these farm prizes being given—certainly so far as the Journal was concerned. But in his neighbourhood he thought it would be a very great disappointment if the visit of the Royal Agricultural Society were not to be accompanied by some such standard and certificate of merit as was given to those who won the farm prizes. He confessed he rather regretted the decision at which the Committee had arrived. He felt that, if possible, longer notice should have been given of the intention to discontinue the prizes, because he thought that it had been understood that these prizes would be given in connection with the Chester Meeting. He did not know whether it would be possible to reconsider the matter, and to give prizes for farms—at any rate, for next year.

Earl CATHCART said that there was a great deal in what the noble lord had stated; and if preparations had been made in anticipation of the competition, the prizes might, perhaps, be continued for another year. But he had understood on all sides that no preparations had been made, and he believed the Local Committee acquiesced in what had been done. The whole matter had been very carefully considered, and he thought the Committee had come to the right decision. At the same time, they were entirely in the hands of the Council; and he saw no objection to going on for another year, if it were desired. The Committee only wished to do what was best in the interests of the Society and of agriculture generally.

The Hon. CECIL PARKER said there had been no public announcement in regard to the prizes for farms, and any proposals which had been made respecting them were only known to members of the Local Committee. After hearing the expression of opinion made by Sir Matthew White Ridley and others at the May meeting of the Council, he had told the Local Committee that he did not think the Council would be disposed to accept prizes for farms.

Mr. DENT stated that the matter had been mentioned at the meeting of the General Chester Committee that morning, and no objection was raised by the representatives of the Local Committee to the course which was proposed. Having had an opportunity of conversing with members of the Society, and recollecting the competitions that had been held before (the very poor competition in his own county for instance), he thought the plan suggested by the Journal Committee was far better. They had not had any idea of giving a certificate of merit, but that certain farms should be selected as being typical of the agriculture of the district, and that someone qualified

to do so should write articles upon them for the Journal.

Mr. TERRY said that, having been lately engaged as a Judge of farms, he had found that, in the opinion of the farmers whom he had met, the competitions did great good in the districts in which they were held. He quoted the opinion of Mr. John Treadwell, who had entered his farm for competition on several occasions, and who had expressed to him how much he owed of his success in farming to these competitions. They were now going into an enterprising district, and he hoped the Council would see their way to continue the farm prizes for next year.

Mr. WALTER GILBEY suggested that some system should be adopted similar to what was done by the Minister of Agriculture in France, and that the Society should give a gold medal—or some other distinction of the kind, which might be handed down by the receiver—to the farmers whose farms were selected for description in the Journal.

The Hon. CECIL PARKER pointed out that if Mr. Gilbey's suggestion were adopted it would place the Local Committee in a very invidious position. The Committee would not care to select farms in the way proposed, knowing that one of them was to have a gold medal.

The CHAIRMAN thought it would have been more satisfactory if they could have known what would be the expense of the alternative plan of appointing a Commissioner or Commissioners to visit typical farms in the district.

Mr. GARRETT TAYLOR said that although he supported the idea of visits by Special Commissioners in the first instance, he did not anticipate that prizes or distinctions would be eliminated altogether. He moved that the prizes for farms be continued for another year, with a new system of judging. They might make the awards in one visit, which would reduce the expense immensely. They would then have an opportunity of seeing how the new system worked, before definitely committing themselves to the policy of having no farm competitions at all.

Mr. MAINWARING felt bound to say, from his own observation, that the prizes were not at all expected, and the general opinion was that the expense of the judging of these farm competitions was out of all proportion to the value of them.

Mr. TAYLOR'S amendment was seconded by Lord EGERTON of TATTON, and, at his suggestion, it was altered so as to read as follows:—

> That the farm prizes be continued for another year, with such modifications in the method of judging as may be recommended by the Journal Committee.

On a show of hands, the amendment was declared lost by six votes to eighteen. The report of the Journal Committee was then adopted.

Chemical.

Viscount EMLYN (Chairman) reported that Dr. Voelcker had attended before the Departmental Committee on the adulteration of fertilisers and feeding-stuffs, and had banded in the memorandum of the Chemical Committee on the subject. The suggestions made at the general meeting held on June 22 in the Showyard at Warwick had been considered, and the Committee recommended that the answers be as follows:—

(*a*) Mr. PHILIP SALTMARSHE: "*That the Society's charge for analysis of feeding-stuffs should be reduced from* 10*s. to* 5*s.*"

This question, among others, was very carefully considered in 1888 by Sir John Thorold's Committee, and after reviewing the statistics of recent years, the Council see no reason for coming to a contrary conclusion to that arrived at in 1888, viz., "That the fees for analyses should not be reduced." The experience of the Chemical Committee has been, that although reductions in the fees for certain analyses have been made from time to time, this action has not been accompanied by any proportionate increase in the number of samples of that class sent for examination. In feeding-stuffs a reduction of the fee for a partial analysis was made some time ago, and as low a charge as 2*s.* 6*d.* per sample was fixed; but the

statistics of recent years show that comparatively few analyses at this lower charge are asked for—only between 5 and 6 per cent. of the total number of samples sent per annum —and that members who send feeding-stuffs for analysis wish to have the full analysis at the 10*s.* fee, in preference to the lower-priced one.

(*b*) Mr. THOMAS FAWCETT: "*That the privileges of chemical analysis should be extended to all members of the Society, whether farmers or merchants.*"

The Chemical Committee consider this proposal most undesirable, having had this matter under their consideration on several previous occasions.

On the motion of Lord EMLYN, the usual quarterly report of the Chemical Committee on cases of impure manures and feeding-stuffs analysed in the Laboratory was approved and adopted, and ordered to be published in the Journal. (See page 585.)

Seed and Plant Diseases.

Mr. WHITEHEAD (Chairman) stated that from a report presented by Dr. Voelcker upon the progress of the Potato Experiments, it appeared that the early application of the Bouillie Bordelaise had been made in the case of all the experimental stations. As yet no disease was reported as having made its appearance at any of the stations.

The following letter had been read from Miss Ormerod, resigning her post of Honorary Consulting Entomologist to the Society on account of ill-health:—

[COPY]. Torrington House,
St. Albans,
July 19th, 1892.

DEAR MR. CLARKE,—I greatly regret to be obliged to inform you that, in consequence of bad health, I find myself compelled to relinquish my post as Hon. Consulting Entomologist of the Royal Agricultural Society of England.

I need not say the great reluctance with which I retire from such an honourable position, but I have now for many months suffered seriously from ill-health, coincident with the pain of neuralgic sciatica and am medically advised that some reduction in amount of work is absolutely necessary for restoration of my health. Also, I cannot feel easy in holding such an important post whilst not able fully to cope with all the engaged duties of an official position.

Therefore, with very great regret, I tender my resignation of the office; but still, should it be desired that, pending new arrangements as to my successor in office, I should reply just to pressing inquiries concerning agricultural insect pests, with the understanding that, if requisite, a delay of two or three days in reply would be permitted, this I could (and also would) gladly do.

In retiring from the honourable post of an officer of the Royal Agricultural Society of England, I must beg to again mention the great regret with which I feel obliged, after long consideration, to take the step. But I trust, as it is solely on account of my health not allowing me to fulfil more than a portion of the official duties of the post, that thus I may in no way risk forfeiting the friendly relations which I have the honour and pleasure of believing exist between myself and the Council and staff of the Society, and that, independently of engaged work, I may be permitted to offer, should occasion require, such assistance as my health may permit.

I beg to remain, yours truly,
(Signed) ELEANOR A. ORMEROD.

Ernest Clarke, Esq.,
Secretary of the Royal Agricultural Society of England.

The Committee recommended that Miss Ormerod's resignation be accepted, with an expression of the thanks of the Council for the valuable services which she had rendered to the Society, and of sincere regret at the necessity for her retirement. The Committee proposed to consider at their first meeting after the recess the arrangements for the appointment of a new Consulting Entomologist. Miss Ormerod had kindly undertaken to give attention to any pressing entomological matters which might arise in the meantime.

Mr. WHITEHEAD, in presenting this report, said he was sure the Council would feel deep regret at the resignation of Miss Ormerod, who had rendered such valuable services to the Society by diffusing a sound and proper knowledge of economic entomology among agriculturists; and he was confident the feeling of regret would be mingled with sympathy and concern at the cause of her resignation, viz., the unsatisfactory state of her health. In fact, Miss Ormerod's medical adviser had ordered her to abstain from much of her work. Miss Ormerod had elected to give up that portion of her labours which was, so to speak, obligatory, and to retain that which was more or less within her own control. The members of the Society at large—who would, he was confident, share the Council's regret at Miss Ormerod's resignation—had had the advantage of reading her valuable reports which had been published from time to time, as well as the annual reports which had appeared in the Journal of the Society, and they had gained very much knowledge concerning the insects injurious to their crops, and the remedies calculated to lessen those injuries. With regard to the Seeds and Plants Committee, it went without saying that they very much deplored the resignation of Miss Ormerod, on account of the valuable services which she had rendered to them, and to the Society, and on account of the severance of relations which had been very pleasant for a long series of years. They had, moreover, to face the great difficulty of replacing Miss Ormerod, and of finding a proper successor for her. It was satisfactory to be able to state that Miss Ormerod had consented to assist the Society by giving advice to members who might apply during the recess, and he only hoped that members would not trouble her unnecessarily with questions that were not specially important. It was also satisfactory to believe that Miss Ormerod would, if her health permitted, continue her work in economic entomology as applied to agriculture, by which she had been able to spread so much valuable knowledge in this country, and he might say throughout the world. (Hear, hear.)

Earl CATHCART concurred with every word spoken by Mr. Whitehead on this subject, and cordially agreed with him in his regret. He looked upon Miss Ormerod as the foundress of a school. She had one large book upon the subject of injurious insects already published, and he understood that she had now in the press an illustrated work which would be an admirable text-book for farmers, and also for the technical schools which had been established.

The following resolution was then moved by Mr. WHITEHEAD, seconded by Lord CATHCART, and carried unanimously:—

> The Council feel that they cannot allow their official relations with Miss Ormerod to cease without placing upon record their regret that the unsatisfactory state of her health necessitates her retirement from the post of Honorary Consulting Entomologist to the Society, and their high sense of the valuable services which she has rendered to the Society in advancing the knowledge of economic entomology as applied to agriculture.

The CHAIRMAN, in putting the motion, said he felt he only spoke the sense of every member of the Council in expressing their regret that Miss Ormerod felt obliged to resign, and that the Society would lose to some extent her valuable services.

Veterinary.

Sir JOHN THOROLD (Chairman) reported the recommendation of the Committee that Professor Brown should be asked to write a leaflet on the cure of Contagious Foot-rot, and that his article in the last number of the Journal be published by the Society as a sixpenny pamphlet. They referred the details of the proposed publication to the Journal Committee.

As under clause 4 of the scheme for the Registration of Farriers or Shoeing Smiths, half of the Society's six representatives upon the Registration Committee retired, but were eligible for re-appointment, the Committee recommended the re-

appointment upon the Registration Committee of the President of the Society for the time being, the Chairman of the Veterinary Committee for the time being, and Mr. Charles Clay.

Professor Brown had presented the following report :—

PLEURO - PNEUMONIA. — Since June 1 there have been only four outbreaks of this disease in Great Britain, in the counties of Lancaster, London, and York (W.R.), and Forfar. In the corresponding period of last year there were forty-eight outbreaks, distributed over twenty-two counties.

FOOT-AND-MOUTH DISEASE.—No cases of this disease have been discovered in Great Britain since the week ended June 10; and now the whole of the restrictions placed on the movement of animals by the Board of Agriculture on account of foot-and-mouth disease have been removed.

SWINE FEVER.—During the past seven weeks there have been 549 outbreaks of this disease in Great Britain; 2,757 pigs were attacked, 1,434 diseased swine were killed, 986 died, 232 recovered, and 222 remained alive when the last published return was made up.

ANTHRAX.—During the past few weeks there have been two rather serious outbreaks of this disease in Sussex,—one at Chalvington, and the other at Ringmer. In one of these outbreaks some twenty animals, including two horses, died; and one of the men employed on the farm, who killed a diseased cow before the nature of the disease was known, got inoculated, and died.

Contagious Foot-Rot in Sheep.

Earl CATHCART moved:

That as the existence of a contagious form of Foot-rot in Sheep is now an established fact, the Veterinary Committee be requested to inquire and report as to means (if any) that may be taken or suggested for preventing, or minimising, the effects of this widespread and disastrous contagion. And that the Committee be further requested to inquire as to action taken by the United States of America State Department of Agriculture in regard to Sheep Foot-rot contagion—a contagion scheduled in the United States together with Sheep-Pox and Scab.

He said his motion was in no sense a contentious one, but as he had originally brought this matter forward, he naturally wished to keep it alive. They were very much indebted to Professor Brown for the able paper he had written in the last number of the Journal [see p. 276], and for the candid manner in which he had admitted the contagious nature of foot-rot, which in this country had never before been sufficiently recognised. The Americans in that respect were before them. In the United States the words "contagious diseases" included and applied to all or any of the following diseases :—"Anthrax in cattle, sheep, goats, or swine; contagious pleuro-pneumonia in cattle; tuberculosis in cattle; foot-and-mouth disease in cattle, sheep, goats, and swine; rinderpest in cattle and sheep; sheep-pox, foot-rot, and scab in sheep; hog cholera; and swine plague in swine." He wished to ask the Veterinary Committee to ascertain what were the inland regulations in force in the United States with regard to foot-rot. An extract from the American Regulations, which had been kindly furnished to him by the veterinary authorities, merely referred to imports from other countries. He was interested to know what (if any) were the inland regulations. Nothing could be more admirably candid than the announcement with which Professor Brown opened his article :—"In the history of sheep husbandry, foot-rot has always been referred to as a scourge of the race, causing serious losses wherever it appears, and in some parts of the world the malady assumes a degree of malignancy which entitles it to be classed among the most virulent of animal plagues."

During the period of thirty-six years that he (Lord Cathcart) had himself been engaged in farming (from the year 1850 to 1886), he believed he lost more money from contagious foot-rot than from any other cause. As soon as he got

rid of it, the first market purchase was usually the means of bringing it back again. He thought it was very important that the directions in the leaflet that it was proposed to issue should be very specific as to the actual diagnosis of the contagious complaint, as compared with that which was merely accidental or mechanical. The directions should be perfectly plain to everybody interested in the subject. They should have reports, if possible, from different districts as to the prevalence of this contagious disease, so that flockmasters might in their own interests take care that the animals they purchased were free from the disease. General diffusion of knowledge was much more important than any legislation or Departmental Orders. They should trust to the general sense of the public to deal with it, as it would be very difficult to control the disease in the same way as other contagious diseases. He thought that the reprint of Professor Brown's paper in the Journal, with additions and alterations by the Professor, would be the best means of dealing with the disease in their present state of knowledge on the subject. The pathology of the disease was not, at present, fully understood, and required to be much further investigated.

Professor SIMONDS said that, with reference to the pathology of foot-rot, he thought (notwithstanding the experiments which had been so successfully carried out by Professor Brown) that there would be the greatest possible difficulty on the part of owners, farmers, and others to distinguish the ordinary diseases of the sheep, which were exceedingly common, and arose from very many different causes, from the true contagious foot-rot, and that being so, there might be great practical difficulties in the way of carrying out any regulations which would be in themselves sufficient to arrest the progress of foot-rot. They could not, under any circumstances, knowing that they were true cases of foot-rot, deal with the sheep at all, which thus became locked up on the farmers' premises, and could not be turned into money. There were great difficulties in the way of dealing with this disease in the same way as with other contagious diseases of cattle and sheep, which could be readily recognised; but there were no difficulties in the way of further investigation, and he would be willing to lend a hand in carrying out any regulations that might be made.

Earl CATHCART was very much obliged for the remarks of Professor Simonds, who took the same view of the subject as himself. It was still quite uncertain whether the contagion was taken from the foot locally, or whether with the food into the mouth, or in both ways.

Sir JOHN THOROLD would only say, on the part of the Veterinary Committee, that they had been for some time engaged, with the help of Professor Brown and the Royal Veterinary College, in investigations into the nature of foot-rot in sheep, and they were anxious to go on with them. Any information which they could obtain from America or otherwise would be published.

Lord Cathcart's motion having been seconded by Mr. SANDAY, was then put and carried unanimously, as a rider to the report of the Veterinary Committee.

Stock Prizes.

Mr. SANDAY (Chairman) said that the circumstances connected with the entry by Mr. Peter Blundell of the Shire stallion "Prince Harold" at the Doncaster Meeting of 1891 had again received careful consideration, and the Committee, not considering the explanation of the exhibitor as satisfactory, recommended that entries from Mr. Blundell be not accepted at future Meetings of the Society. The Committee reported that, as it appeared that the Jersey heifer exhibited in Class 86 by Mr. Gilbert Greenall was not "Rose Adieu," entered in the catalogue as No. 911, but another heifer born on a different date and with a different pedigree, the Secretary had been instructed to request an explanation from the exhibitor. Mr. Greenall replied that he had purchased this heifer with three others at the sale of Mr. G. W. Hastings's stock at Great Malvern, and that the heifer was sold to him

by the auctioneers under the name and pedigree with which he had entered her. The circumstances of the case having heen fully investigated hy the Committee, they recommended that, as the heifer exhihited at the Show was not the animal descrihed on the certificate of entry, the award of the first prize to Mr. Greenall he cancelled, and the prizes in Class 86 awarded as follows :—No. 902, First Prize of 10*l.* to Mr. Salishury Baxendale, for Tamarisk (Second Prize); No. 903, Second Prize of 5*l.* to Mr. James Blyth for Alpha (Reserve No. and H.C.).

The first-prize winners in Classes 72 and 150 having also hecome disqualified, the Committee recommended that the prizes he awarded as follows, in the event of the animals complying with the regulations:—

CLASS 72.

No. 711. First Prize of 10*l.* to Sir Henry Wiggin, Bart., for "Martha" (Second Prize).

No. 708. Second Prize of 5*l.* to Col. Henry Platt for "Blodwen 2nd" (Reserve Numher and H.C.).

CLASS 150.

No. 1701. First Prize of 10*l.* to Mr. Denston Gihson for "Metchley Dairymaid" (Second Prize).

No. 1704. Second Prize of 5*l.* to Mr. Sanders Spencer for "Holywell Rissole" (Third Prize).

No. 1706. Third Prize of 3*l.* to Mr. A. C. Twentyman for "Fairy" (Reserve Numher and H.C.).

A letter had heen read from the Hunters' Improvement Society offering medals for hunter hrood mares under certain conditions; hut the Committee were unahle to recommend the acceptance of the offer. Several cases of infringement of the regulations hy stock exhibitors' servants had heen reported by the Stewards, and the Committee advised that the fines imposed hy the Stewards he enforced. The Committee had made progress with the draft prize-sheet for the Chester Meeting, and would give further consideration to it when the proposals for local prizes to he made hy the Local Committee were hefore them. Various letters as to exhihits of live stock at the Warwick Meeting had been read, and directions given thereon.

Implement.

Mr. FRANKISH (Chairman) presented the recommendation of the Committee that a prize of 20*l.* he offered in connection with the Chester Meeting for the hest sheep-shearing machine worked hy power. The Committee had considered the recommendation of the Judges of miscellaneous implements at Warwick for competitive trials of petroleum engines and "hay-kickers." As it had already heen decided to have trials of sheaf-binders, and also of sheep-shearing machines, at the Chester Meeting of 1893, the Committee felt that no further trials of implements could he undertaken for next year, but they recommended that the question of trials of oil engines and hay-kickers should receive first consideration when the arrangements were heing discussed for the Meeting of 1894. The Committee had considered an application from Mr. Frank Proctor as to his steam digger, and recommended that no further facilities he given him in connection with it. The Committee had considered the case of a firm of exhihitors who had been reported for the infringement of No. 58 of the Implement Regulations hy nailing their signs with large nails through the canvas, and recommended that payment of the fine and damage be pressed for.

General Chester.

Mr. DENT reported that the following gentlemen, nominated hy the Local Committee, had heen elected memhers of the Committee, with the addition of Mr. W. Peers (Clerk of Committees to the Town Council): the Mayor, the Town Clerk, the City Surveyor, the Hon. Claud H. Vivian, Mr. John Scovell, and the Honorary Secretary, Mr. G. A. Dickson. After discussion it had heen agreed to recommend that the Chester Meeting he opened on Monday, June 19, 1893, the Implement Yard and Dairy heing opened on the previous Saturday, June 17. The final dates for the receipt of entries for the Chester Meeting had been fixed as follows :—

Implements, &c.: Saturday, April 1, 1893; post entries at double rates, Saturday, April 8. *Live Stock, Poultry, and Produce*: Monday, May 1; post entries at double rates, Friday, May 12. The Local Committee had reported that they intended to make the champion prize for Cheshire cheese of the value of 100*l.*, instead of 50*l.* as originally proposed.[1]

Showyard Works.

Sir JACOB WILSON (Chairman) reported that the whole of the shedding at Warwick had been pulled down, and a large portion of the Society's plant had been sent to Chester, where it was being stored away. Two sales had been held of materials, which realised fairly satisfactory prices. The concluding sales would take place on August 4 and 5, by which time all the permanent plant would have been removed. Various accounts connected with the Show had been presented and passed.

Education.

Lord MORETON (Chairman) reported that the Text Book Sub-Committee had held a meeting for the purpose of settling various points of detail in connection with the forthcoming revised edition of the Society's Text Book on the Elements of Agriculture. A letter had been read from the headmaster of the Hanley Castle Grammar School, stating that the approval of the Committee of Council on Education was at present withheld from the Charity Commissioners' scheme for the administration of the Foundation, in consequence of a local petition against it, and asking the Society's assistance in petitioning the Committee of Council that the scheme might be proceeded with forthwith. The Committee could not recommend the adoption by the Society of any steps in this direction.

Dairy.

The Hon. CECIL T. PARKER (Chairman) reported that it had been decided to adopt a suggestion made by the Judges of butter-making at Warwick, that in future any competitor who had won a first prize during the competition should not be allowed to compete again, except in the champion class. It had also been decided to add to the regulations for the butter-making competitions a clause prohibiting the artificial colouring of the butter. The Secretary having reported that the last edition of the "Simple Rules for Butter-Making" had been sold out, the Committee recommended that a further reprint of 2,000 copies be made, including a slight alteration in a portion of the text. Various letters as to the poultry department of the Warwick Meeting had been read, and directions given thereon.

Preparation of Poultry for Market.

Sir JOHN THOROLD then moved, on behalf of Mr. Pell (absent):—

> That the Council should consider the question of trussing and preparing dead poultry for market, with the view of prizes being awarded for proficiency at the Chester Meeting.

He understood that there would be some difficulty about prizes being awarded; but as the subject was of very great interest, he hoped it would be referred to the Stock Prizes Committee, when Mr. Pell would be able to be present to advocate it.

Sir MASSEY LOPES seconded the motion, which was adopted.

Docking of Foals' Tails.

The Hon. CECIL T. PARKER, on behalf of the Duke of Westminster (absent), then moved:—

> That in future no foals with docked tails should be entered for the Society's Country Meetings.

He thought perhaps the better way might be to ask leave of the Council to refer the question to the Stock Prizes Committee.

Sir NIGEL KINGSCOTE hoped the matter would be settled at once. To his mind, it was a horrible thing that foals should be turned out with docked tails, and therefore without the means of keeping off flies. He thought it was a barbarous custom to dock the tails of horses at all.

The Hon. C. T. PARKER had no

[1] The Local Committee have since decided to increase by 5*l.* the first prize in each of the eight classes of Cheshire Cheese for which they are offering prizes. (See Schedule of prizes on page lxxiv of the last number.)

objection to an immediate decision if the Council thought it desirable.

Sir JACOB WILSON said he had received several letters on the subject from Members of Council, and seeing it was a very important question, and opinions differed upon it amongst practical men, he thought it would be better for the matter to be referred to the Stock Prizes Committee, as Mr. Parker had suggested.

Mr. SANDAY felt it was undesirable to settle the question then, when there was really no time for its consideration. He moved as an amendment that the matter should be referred to the Stock Prizes Committee, though, as Chairman of the Committee, he had no special desire for this course to be taken.

Mr. MAINWARING thought it would be better to refer the matter to the Stock Prizes Committee, so that any objections might be heard. At the same time, he personally thought it would be a good thing if the docking of tails were stopped.

Mr. TREMAYNE asked why the Stock Prizes Committee should be selected as the tribunal to which this matter should be referred.

Sir JACOB WILSON replied that the Stock Prizes Committee was supposed to contain representatives of all the different breeds of horses, and, moreover, the resolution, if passed, must come before that Committee in connection with the regulations for the prize-sheet.

Viscount EMLYN pointed out that all the members of the Stock Prizes Committee were also members of the Council.

Mr. WALTER GILBEY said that if horses' tails were not docked whilst they were young he did not know when they would be docked. If the docking were done when the animal was young, it was no punishment to it; whereas, if the operation were delayed, it was much more painful to the horse. The motion, if carried, would be almost a veto on docking horses' tails at all. Such a rule, if passed, would not prevent his docking the tails of his foals, because, otherwise, when they were grown up he would not be able to sell them. He thought the resolution should be postponed.

Sir MASSEY LOPES moved an amendment, which was seconded by Mr. DENT, to the effect that the question should be postponed for consideration by the Council at their next meeting.

Mr. MARTIN said the question was a very wide and difficult one. If horses had to be docked at all, it was less painful when they were young. They would soon come to the question of docking sheep. He was in favour of postponement.

The amendment of Sir Massey Lopes, for the postponement of the consideration of the question until the next meeting of the Council, was then put and carried by general consent.

Country Meeting of 1894.

The SECRETARY read formal invitations to the Society from the local authorities of Cambridge and St. Albans for the Country Meeting of 1894 to be held in their respective towns, and the thanks of the Society were ordered to be sent therefor, the invitations to be further considered after the recess.

Dates of future Meetings.

On the motion of Sir JACOB WILSON, the date of the general meeting of Governors and Members in December was fixed for Thursday, December 8.

The Council then adjourned over the autumn recess until Wednesday, November 2, 1892.

Proceedings at General Meeting of Governors and Members,

HELD IN THE LARGE TENT IN THE

SHOWYARD AT WARWICK.

TUESDAY, JUNE 21, 1892,

THE EARL OF FEVERSHAM (PRESIDENT) IN THE CHAIR.

Present on the Platform.

H.R.H. Prince Christian, K.G., the Duke of Westminster, K.G. (President-elect), the Marquis of Headfort, the Marquis of Hertford, the Earl of Coventry, the Earl of Lathom, the Earl of Ravensworth, Lord Brooke, M.P., Lord Brougham and Vaux, Lord Leigh, Lord Moreton, Lord Tredegar, the Hon. Cecil T. Parker, Sir Archibald Macdonald, Bart., Sir Joseph Spearman, Bart., Col. Sir Nigel Kingscote, K.C.B., Sir Jacob Wilson, Mr. G. M. Allender, Mr. J. H. Arkwright, Mr. A. Ashworth, Mr. Jos. Beach, Mr. J. Bowen-Jones, Mr. Chandos-Pole-Gell, Mr. Charles Clay, Lieut.-Col. J. F. Curtis-Hayward, Mr. J. Marshall Dugdale, Mr. William Frankish, Mr. Walter Gilbey, Mr. A. Hamond, Mr. J. Hornsby, Mr. C. Howard, Mr. T. H. Miller, Mr. P. A. Muntz, M.P., Mr. A. Pell, Mr. J. E. Ransome, Mr. G. H. Sanday, Mr. A. J. Smith, Mr Henry Smith, Mr. Martin J. Sutton, Mr. Garrett Taylor, Mr. E. V. V. Wheeler.

There were also present as representatives of the Local Committee:—The Mayor of Warwick (Mr. J. W. Mann), the Mayor of Leamington (Mr. Joseph D. Barbour), Mr. F. H. Moore (Local Secretary), &c.

In the tent itself there was a crowded attendance of the general body of Governors and Members.

Award of Farm Prizes.

The first business of the meeting was the opening of the sealed awards of the Judges of Farms (Messrs. J. B. Ellis and Jos. P. Terry), which the SECRETARY read as follows:—

Class 1.—Arable and grass farm of over 250 acres, of which not less than one-third is arable:—

First Prize, 80*l*., John Palmer, Hampton-on-Hill, Warwick.

Second Prize, 40*l*., Henry E. Thornley, Radford Hall, Leamington.

Third Prize, 20*l*., Joseph Hawkes, Bearley Grange, Stratford-on-Avon.

Reserve No., John James, Whitchurch Farm, near Stratford-on-Avon.

Highly Commended, E. A. Cubberley; W. H. Grimes, jun.

Class 2.—Arable and grass farm of over 150 acres and not exceeding 250 acres, of which not less than one-third is arable:—

First Prize, 60*l*., Josiah Denny, Budbrooke, Warwick.

Second Prize, 40*l*., Richard Coles, Offchurch, near Leamington.

Reserve No., John R. Reeve, Lillington, Leamington.

Class 3.—Arable and grass farm of over 50 acres and not exceeding 150 acres:—

First Prize, 40*l*., Lewis Willday, Dunton, Minworth, Birmingham.

Second Prize, 20*l*., Anna Bolton Spencer and Samuel K. Spencer, The Mount, Black Hill, Snitterfield.

Reserve No., Charles Thornton, Curdworth, near Birmingham.

Presentation of Stallion Medals.

The PRESIDENT next presented the Gold Medals, awarded by the Society through the Warwick Local Committee, to the owners of the three thoroughbred stallions which won the service premiums of 200*l.* each at the Spring Show held in London in March last, viz.: to Mr. E. G. Crowhurst for "Just-in-Time," to Lord Tredegar for "Lord Molynoo," and to Mr. J. C. Harford for "Rameses."

Vote of Thanks to Mayor and Corporation of Warwick.

H.R.H. PRINCE CHRISTIAN said he had been asked to move "That the best thanks of the Society are due, and are hereby tendered, to the Mayor and Corporation of Warwick for their cordial reception of the Society." He did so with great pleasure, because he was sure they all must feel very grateful for the cordial reception which they had received. The Mayor and Corporation had done everything they could to meet the wishes of the Royal Agricultural Society, and he felt quite sure that if the Meeting that year should prove a success, as he believed and trusted, it would be chiefly due to the kind endeavours of the Mayor and Corporation. (Cheers.)

Mr. C. S. MAINWARING said that as Senior Steward of Stock it was his agreeable duty to second the resolution which had been proposed by H.R.H. Prince Christian. He felt great personal pleasure in so doing, because he remembered, as he had the honour of being one of the Committee of Inspection when they came to view the site, the hospitality then extended to them by the Mayor and Corporation of Warwick. They had decorated the town most beautifully, and had done all that lay in their power to add to the success of the Show.

The vote having been carried by acclamation,

The MAYOR (Mr. J. W. MANN) cordially thanked them on behalf of the Corporation, and also on behalf of the Executive Committee, for their very kind vote of thanks, and for the expressions conveyed by His Royal Highness. They trusted that the Show would be entirely satisfactory, and that the Society would look back with pleasure upon their visit to Warwick. He hoped that the twentieth century might not be far advanced before the Society came there again, when he was sure they would have a welcome as cordial, and he trusted a success as great, as he hoped would be the case upon the present occasion. (Cheers.)

Vote of Thanks to Local Committee.

The Earl of RAVENSWORTH said he had been asked to propose "That the best thanks of the Society are due and are hereby tendered to the Warwick Local Committee for their exertions to promote the success of the Meeting." They were doubtless all aware how much depended upon the exertions of the Local Committee wherever they had their Meeting, and the handsome, liberal manner in which on every occasion within his recollection (and it was a long one) they had been assisted and aided in every possible way by the Local Committee. On no occasion had those exertions been more valuable and more freely extended than by the Warwick Committee. He should ask permission to couple with the resolution the name of an old friend of his own, Lord Leigh, who, for the second time during the last generation, had taken an active part in promoting the success of their great exhibition in that town.

Mr. ROWLANDSON, as Steward of Implements, had great pleasure in seconding the motion. Every requirement of the Implement Stewards had been most satisfactorily attended to by the Warwick Local Committee.

The motion having been carried unanimously,

Lord LEIGH thanked his noble friend (Lord Ravensworth) very much indeed for the kind manner in which he had proposed the resolution of thanks. He was extremely pleased to see the Royal Agricultural Society again visiting their old town, and he thought their thanks were due to Lord Warwick for having placed his magnificent park at their disposal. Lord Ravensworth had alluded to his having taken a part at the time when the Royal Agricultural Society was at Warwick in 1859—thirty-three years ago. It did not often fall to the lot

of a man to serve upon a committee of this sort twice in his lifetime. It so happened that he had the great honour and privilege of introducing the deputation to the Royal Agricultural Society in 1859, and the same privilege in 1892, and on both occasions he was successful. He could only say that he was delighted to find that the Society was again visiting them. In 1859 he thought the buildings of the Society covered a spaee of about ten acres. On the present occasion he believed they covered a space of ninety aeres. That was an extraordinary fact, and showed how the Royal Agricultural Soeiety had grown during that period.

Vote of Thanks to the Earl of Warwick.

Mr. Bowen-Jones (Steward of Cattle) said they eould not separate without according the best thanks of the Society to the Earl of Warwiek for the use of his park for the purposes of the Society's Country Meeting. He (Mr. Bowen-Jones) was now growing somewhat old in the membership and in the service of the Soeiety, and he had attended very many of its Country Meetings, the first of whieh was at Warwiek, thirty-three years ago; but he had never in the whole course of his experience seen a more beautiful ground than the one that had been plaeed at their disposal by the Earl of Warwiek. In no small degree, he believed, would this be the means of causing the Meeting to be a great suecess, and they would all cordially agree with him in returning to the noble Earl their best and most eordial thanks.

Sir Nigel Kingscote, in seconding the resolution, said that although comparisons were odious, he was bound to say the Soeiety was never in a more suitable and pieturesque ground than it was at present. They all felt that wherever they might go hereafter the beauty of the Show at Warwick in the park of the Earl of Warwick would never be surpassed. (Cheers.)

The motion was then put by the President, and carried amidst loud cheers.

Lord Brooke, M.P., said he regretted extremely that his father, Lord Warwiek, was unable to be there that day to aeknowledge personally the kind manner in which they had offered him thanks for giving his park for the use of the Show. One of the pleasantest duties of an Englishman was the privilege of being allowed to offer hospitality to his friends; and, therefore, it was with great pleasure that Lord Warwick, when they decided that his park was the one most suitable for their Show, gave consent that it should be used. To him, he eonfessed, one of the greatest pleasures of the day had been to see his father there taking a small part in the proceedings, although the interest whieh he had shown had only been the end of what he had felt for a considerable time—in faet, since the idea of the Show in that park was first started. He might also say what great pleasure it had given them to have had H.R.H. the Prinee of Wales and H.R.H. the Duke of York in their house. They all regretted most deeply that that visit had not been shared by one whom they all loved and respeeted, the Princess of Wales; but events of great sadness had occurred in this eountry which had touehed them most deeply, and naturally the mourning which Her Royal Highness had felt so aeutely had prevented her presenee on that oecasion. He thanked them most heartily for their very kind vote of thanks, and his family had only been too pleased that their park had been of any use to them.

Suggestions by Members.

In response to the usual inquiry from the Chair as to whether any member had remarks to make or suggestions to offer for the consideration of the Council,

Mr. George Gibbons drew the attention of the Soeiety to the faet that they had had free trade in importing eattle diseases from abroad. Those diseases had been of enormous disadvantage to them up and down the country. Since that time there had been an alteration. They had now a Board of Agriculture to look after them, and a splendid man who, during the last few months, had exerted himself right manfully to combat those diseases by which they had recently been attacked. He moved "That the thanks of the Royal Agricultural Society be given to the Right

Hon. Henry Chaplin for the decisive manner in which he has dealt with the cattle diseases of the country." This resolution, having been seconded, was unanimously adopted.

Mr. SALTMARSHE referred to the reduction of fees for analyses of feeding stuffs by farmers' clubs throughout the country, and suggested that a similar reduction should be made for analyses in the laboratory of the Society in London.

Mr. THOMAS FAWCETT expressed his opinion that at present there was a very great injustice to the members of the Royal Agricultural Society who were traders. Everything seemed to be in favour of the gentleman who happened to be a farmer. Unfortunately or fortunately he was not a farmer, and he would suggest to the Council the desirability of ascertaining the views of the members upon this subject. At the present time he failed to get the benefit as a member to which his annual subscription entitled him. He felt it very unjust that whilst those who were farmers could avail themselves of the services of the Consulting Chemist, equal facilities were not given to members who were merchants.

Vote of Thanks to Retiring President.

The Marquis of HERTFORD then moved the next resolution: "That the best thanks of the Society are due and are hereby tendered to the Earl of Feversham for his services as President during the year." He wished that this resolution had been entrusted to one who knew more of the practical working of the Society than he did, but, at the same time, he felt that it required very few words from him to induce them to give their best thanks to Lord Feversham for the way in which he had presided over the Society during the past year. Lord Feversham had been most punctual and regular in his attendance at the Society's meetings, and had shown in every way that he had the interest of that great Society thoroughly at heart. As many of them knew, Lord Feversham was not only a theoretical farmer but a very practical one. Many of them had seen those magnificent shorthorns which Lord Feversham had bred. He asked them to give their most hearty and cordial thanks to the noble Lord for his services as President during the year.

Mr. FREEMAN-MITFORD, C.B., seconded, saying there could be no doubt as to the way in which the resolution would be received by that meeting. They stood upon a pinnacle amongst all the agricultural societies of the world, and their President occupied during his year of office the very first and most prominent position in all Europe as an agriculturist. Lord Feversham had filled that position worthily, had given his time, labour, and energies to their interests, and it was only fitting, right, and meet that they should accord their thanks to him as heartily as they had done in the other instances in which votes of thanks had been passed that day. Lord Feversham left the chair with an increased reputation as an agriculturist; he could not do so in any other respect. If there were any consolation in losing his services, it was in the knowledge that he would be succeeded by a man fitted and able to carry still further the great work which was being done by their Society.

The motion having been put to the meeting by the SECRETARY, it was declared unanimously adopted, amidst loud cheers.

The PRESIDENT thanked them very sincerely for the cordial manner in which they had received the motion. He need not tell them that he was extremely proud of the position in which their favour had placed him during the past year. He had every reason to be satisfied with the course of their proceedings, and to be sensible of the great assistance which had been given to him by every member of the Council, and by every official connected with the Society; and he took that opportunity of thanking one and all for that kind help. They met that day upon what he might almost call historic ground. In former ages, the Earls of Warwick went forth to do battle for the Throne, for the Constitution, and for their country. That day his noble friend Lord Warwick could look down from his historic castle and see the not less glorious triumphs of peaceful

industry (cheers). They had collected together there a magnificent Show. They had there the products of that superior agriculture to which others had alluded, and which placed this country in the foremost field of agricultural progress. They had there specimens of those splendid breeds of horses, cattle, sheep, and other live stock which did honour to those who had brought them there, and which were only representatives of those valuable breeds of stock which pervaded every portion of this highly favoured land. And they had also there those mechanical appliances which science had brought to the aid of agriculture, and which were so valuable to them, the agriculturists of England, exposed as they were to unlimited competition with the rest of the world. The great object which that Society must have, which it had had in the past and would, no doubt, have in the future, was to assist the farmers of England to increase their production and so to economise their industry and their labour as to enable them, hard and difficult as it was, to compete with the foreign imports into the country. He would not detain them longer, but he specially wished to refer, in regard to the success of that great Meeting, to the valuable assistance which they had received from their friend Sir Jacob Wilson (cheers). He was sure they would all be glad to see him restored, he hoped, to health. He had to thank their Secretary, Mr. Clarke, for the energy and zeal with which he filled his important office. He had to thank the Stewards of Stock and of the various other departments who had spent so much labour, industry, and energy in promoting the arrangements of the Show. He believed that the Society would continue to be conducted with that singleness of purpose, with that integrity, with that straightforward zeal and harmony which had pervaded their proceedings. He believed that the Society was destined in the future, as it had been in the past, to be of the greatest value and benefit to the great industry of which they all were members, and also, he would add, to the people at large. (Applause.)

President for 1892–93.

Colonel Le Cornu said, that as an old member of the Society he had been requested to move: "That his Grace the Duke of Westminster, K.G., do take the Chair as President, after the conclusion of the present Meeting." As the Society would be holding its next Meeting in the historic city of Chester, with which the name of his Grace's family was so intimately connected, it would be a privilege indeed that one who took so vast, so wide, and so varied an interest in agriculture should preside over the Society upon that occasion. He felt sure, in moving that resolution, that it would receive a most hearty response from all the members of the Society, and he, therefore, felt how unnecessary it was for him to add any further words to the motion.

Mr. Jacob Fair, as another old member, seconded the motion. As a Lancashire man he could say that there had been some disappointment that the Society was not going to Manchester. At the same time he thought that the satisfaction was now universal that they were going to the good old city of Chester, and that his Grace would be the President on that occasion.

The Duke of Westminster thanked them extremely for having kindly adopted the motion, and he had to thank the seconder for having kindly reconciled himself to the fact that he had been beaten, though only by one vote. In going to the historic old city of Chester, where they would be most happy to meet the members next year under, he hoped, favourable auspices, he felt some little sinking of heart in looking upon that very beautiful park. But their Meeting would be, first of all, of business, secondly of pleasure, for they could show them the sights which Chester could afford in its rows and in its walls, which were well-worth visiting by those who had not seen them. Nothing should be wanting on his part to promote the success of the Meeting next year, which, he hoped, would be as successful as that held under the excellent auspices of Lord Feversham.

The proceedings then terminated.

WARWICK MEETING.

JUNE 18 TO 24, 1892.

PRESIDENT:

THE EARL OF FEVERSHAM.

Duncombe Park, Helmsley, Yorkshire.

OFFICIALS:

Honorary Director.

Sir Jacob Wilson, Chillingham Barns, Belford, Northumberland.

Stewards of Live Stock.

C. S. Mainwaring, Galltfaenan, Trefnant, R.S.O., North Wales.
J. Bowen-Jones, Ensdon House, Montford Bridge, Salop.
E. V. V. Wheeler, Newnham Court, Tenbury, Worcestershire.
C. W. Wilson, Rigmaden Park, Kirkby Lonsdale, Westmoreland.

Stewards of Implements.

Percy E. Crutchley, Sunninghill Lodge, Ascot.
Dan. Pidgeon, The Long House, Leatherhead.
S. Rowlandson, Newton Morrell, Darlington.

Steward of Dairying, Poultry, and Produce.

Alfred Darby, Little Ness, Shrewsbury.

Steward of Forage.

Major Fosbery, Warwick.

Stewards of Finance.

W. Frankish, Limber, near Brocklesby, Lincolnshire.
G. H. Sanday, Langdale Lodge, Clapham Park, Surrey.

Secretary.

Ernest Clarke, 12 Hanover Square, London, W.

JUDGES OF IMPLEMENTS.

Ploughs.

Mason Cooke, The Lawns, near Ely, Cambridgeshire.
Henry Goodyear, The Austerby, Bourne, Lincolnshire.
William Newton, Crowmarsh Battle, Wallingford, Berkshire.

Miscellaneous Implements.

T. H. Thursfield, Barrow, Broseley, Salop.
Robert Wallace, Auchenbrain, by Mauchline, N.B.

JUDGES OF STOCK, &c.

(As finally corrected.)

HORSES.

Hunters.—*Classes* 2, 4, 5, *&* 6.

R. Chandos-Pole, Sydling Court, Dorchester.
P. A. Muntz, M.P., Dunsmore, Rugby.

Hunters.—*Classes* 1, 3, 7, *&* 8.

M. Angus, Cattleholmes, Hull.
R. T. Bassett, Crossways, Cowbridge.

Coach Horses, and Harness Horses and Ponies.—*Classes* 9, 10, 21, *&* 22.

J. A. Rutherford, Highclere Park, Newbury.
C. B. E. Wright, Bolton Hall, Clitheroe.

Hackneys and Ponies.—*Classes* 11–20.

T. Robson, Wold House, Driffield.
John Rowell, Manor Farm, Bury, Hunts.

Shire and Agricultural.

Classes 23–29; 40 *&* 41.

Thomas B. Freshney, South Somercotes, Louth.
Garrett Taylor, Trowse House, Norwich.

Clydesdales.—*Classes* 30–34.

Adam Gray, jun., Ingleston of Borgue, Kirkcudbright.
James Picken, Langside, Craigie, Kilmarnock.

Suffolks.—*Classes* 35–39.

B. Wade Cooper, 3, Guildhall St., Bury St. Edmunds.
R. H. Wrinch, Harkstead, Ipswich.

CATTLE.

Shorthorn.—*Classes* 42–48.

G. Ashburner, Low Hall, Kirkby-in-Furness.
C. W. Tindall, Scawby, Brigg.

Hereford.—*Classes* 49–55.

J. P. Terry, Berry Field, Aylesbury.
W. Thomas, The Hayes, Sully, Penarth.

Devon.—*Classes* 56–61.

Samuel Kidner, Bickley, Milverton.
William Tait, The Prince Consort's Shaw Farm, Windsor.

Sussex.—*Classes* 62–67.

P. Gorringe, jun., Pebsham, Bexhill.
A. Heasman, Court Wick, Littlehampton.

Longhorn and Welsh.—*Classes* 68–74.

C. F. Priestley, Hirdrefaig, Llangefni.
N. Stilgoe, The Green, Adderbury, Banbury.

Red Polled.—*Classes* 75–80.

E. W. Beck, Norwich.
G. Gooderham, Monewden, Wickham Market.

Jersey.—*Classes* 81–86.

Col. C. P. Le Cornu, La Hague Manor, Jersey.
Hugh C. Smith, Mount Clare, Roehampton.

Guernsey.—*Classes* 87–91.

Hon. & Rev. A. C. Baillie-Hamilton, Combs, Stowmarket.
A. Dunlop, Church Farm, Hendon.

Kerry and Dexter Kerry.

Classes 92–95.

G. Mander Allender, 7 Albemarle Street, W.

SHEEP.

Leicester.—*Classes* 98–101.

Robert Fisher, Leconfield, Beverley.
Benjamin Painter, Burley-on-the-Hill, Oakham.

Cotswold.—*Classes* 102–105.

Thomas Brown, Marham Hall, Downham Market.
Robert Jacobs, Signett Hill, Burford, Oxon.

Lincoln.—*Classes* 106–109.

Charles Clarke, Ashby-de-la-Launde.
H. Mackinder, Langton Grange, Spilsby.

Oxford Down.—*Classes* 110–113.

J. Bryan, jun., Southleigh, Witney.
A. F. Milton Druce, Fyfield, Abingdon.

Shropshire. (Rams.)

Classes 114 *&* 115.

Thomas A. Buttar, Corston, Coupar Angus.
Charles Coxon, Elford Park, Tamworth.

Shropshire. (Ram Lambs and Ewes.)
Classes 116–119.

JOHN E. FARMER, Felton, Ludlow.
RICHARD THOMAS, Baschurch, Salop.

Southdown.—*Classes* 120–123.

J. A. HEMPSON, Erwarton Hall, Ipswich.
HUGH PENFOLD, Selsey, Chichester.

Hampshire Down.—*Classes* 124–127.

JAMES FLOWER, Chilmark, Salisbury.
GEORGE JUDD, Cocum, Micheldever.

Suffolk.—*Classes* 128–131.

WILLIAM HARVEY, Timworth, Bury St. Edmunds.
S. W. SLATER, Cheveley Hall, Newmarket.

Border Leicester.—*Classes* 132–134.

JOHN DAVISON, Tritlington Hall, Morpeth.
JOHN HUNTER, Dipple, Fochabers, N.B.

Clun Forest and Welsh Mountain.
Classes 135–138.

THOMAS JONES, Talybont, R.S.O., Brecon.
EVAN THOMAS, Caewynnick Lodge, Builth.

GOATS.

Classes 139–143.

C. L. JACKSON, Hillfold, Bolton.
J. SELWYN RAWSON, Hough End, Sowerby Bridge.

PIGS.

White.—*Classes* 144–155.

Capt. HEATON, Worsley, Manchester.
Capt. BESWICK ROYDS, Pyke House, Littleborough.

Berkshire and Black.
Classes 156–163.

THOMAS HARRIS, Cublington, Leighton Buzzard.
HEBER HUMFREY, Shippon, Abingdon.

Tamworth.—*Classes* 164–167.

G. MANDER ALLENDER, 7 Albemarle Street, W.
THOMAS HARRIS, Cublington, Leighton Buzzard.

POULTRY.

Classes 168–265.

FRANK BENISON, 68 Regent Street, Leamington.
EDWARD BROWN, 16 Woodberry Grove, N.
R. FLETCHER HOUSMAN, Regent St., Lancaster.
M. LENO, Cox Pond Farm, Hemel Hempstead.
J. W. LUDLOW, Vauxhall Road, Birmingham.

PRODUCE.

Cheese.—*Classes* 266–270.

GEORGE LEWIS, Ercall Park, Wellington, Salop.
P. W. STONE, 105 Victoria St., S.W.

Butter.—*Classes* 271–273.

THOMAS CLEMENCE, 10 Northgate Street, Chester.
JOHN VALENTINE, Broad Street, Ludlow.

Cider and Perry.—*Classes* 274–277.

B. GOODALL, Tenbury.

Jams and Fruits.—*Classes* 278–281.

J. WOOD, Crocken Hill, Swanley.

Hives and Honey.—*Classes* 282–297.

W. BROUGHTON CARR, Orpington.
JESSE GARRATT, Meopham, Kent.
WALTER MARTIN, Wainfleet.

COMPETITIONS.

Butter-making.

D. A. GILCHRIST, University College, Bangor.
HARRY J. HILDYARD, Barkstone, Grantham.

Horse-shoeing.

GEORGE HOLTHAM, Gloucester.
F. T. STANLEY, Montague Street, Borough, S.E.

Farms.

J. B. ELLIS, West Barsham, Walsingham.
J. P. TERRY, Berry Field, Aylesbury

OFFICIAL REPORTER.

W. FREAM, B.Sc., LL.D., Hanover Square, W.

AWARD OF PRIZES AT WARWICK.

ABBREVIATIONS.

I., First Prize. II., Second Prize. III., Third Prize. R. N., Reserve Number. H. C., Highly Commended. Com., Commended.

Unless otherwise stated, each Prize Animal in the Classes for Horses, Cattle, Sheep, and Pigs was "bred by Exhibitor."

HORSES.

Thoroughbred Stallions.

Winners of the Three Premiums of £200 *offered by the Society, and the Special Gold Medals offered by the Warwick Local Committee, at the* Spring Show, *held at* The Royal Agricultural Hall, London, *March* 1-4, 1892.

A. Eusebius Gustavus Crowhurst, Chesham House, Leamington Spa, for **Just-in-time**, chestnut, foaled 1881; *s.* Thunderer, *d.* Reveillée *by* Abergeldie, *g. d.* Alarum *by* Alarm; bred by Thomas Stevens, of Berkshire.

B. Lord Tredegar, Tredegar Park, Newport, Mon., for **Lord Molynoo**, chestnut, foaled 1883; *s.* Sefton, *d.* Lady Emily *by* Gladiateur, *g. d.* Lady Florence *by* Stockwell; bred by Thomas Jennings, Newmarket.

C. John Charles Harford, Falcondale, Lampeter, for **Rameses**, brown, foaled 1885; *s.* Chippendale, *d.* Goddess *by* Cramond, *g. d.* Nutbush *by* Filbert; bred by the Earl of Bradford, Weston Park, Shifnal.

Hunters.

No. in Catalogue

Class 1.—*Hunter Mares and Foals.* [16 entries, 2 absent.]

16 **I.** (**£20.**)—Lord Willoughby de Broke, Kineton, Warwick, for **Blue Stocking**, brown [foal *by* Seamore], age and breeder unknown; *s.* Solon.

6 **II.** (**£10.**)—Major Langlands, Bedford, for **Scarlet**, Vol. V., chestnut, foaled 1886 [foal *by* Conductor], bred by Colonel Grimston, Beverley; *s.* Lambton.

1 **III.** (**£5.**)—John Cooper, East Haddon, Northampton, for **Beatrice 289**, bay, foaled 1883 [foal *by* Punjaub], breeder unknown; *s.* Boreas.

14 **R. N. & H. C.**—Frank B. Wilkinson, for **Better Still 495**.

11 **H. C.**—Piers Thursby, for **Gipsy**.

Class 2.—*Hunter Mares or Geldings, foaled in* 1886 *or* 1887.[1] [22 entries, 4 absent.]

Weight Carriers up to 15 Stone.

24 **I.** (**£25.**)—Henry Ford, Leamington, for **Roaster**, bay gelding, foaled 1887, breeder and pedigree unknown.

[1] Prizes given by the Warwick Local Committee.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

28 II. (£15.)—Joseph Horton, Moseley, Birmingham, for **Tiptop**, bay gelding, foaled 1886, bred by E. & S. Lawry, Trenouth, Cornwall; *s.* Mont Cenis, *d.* Violet *by* Turpin.

25 III. (£10.)—Henry Ford, Leamington, for **York**, chestnut gelding, foaled 1887, breeder unknown; *s.* York.

17 R. N. & H. C.—Ansell Bros., Leamington, for **Pioneer**, grey gelding. H. C.—A. J. Brown for No. 18, **Top Thorn**; A. B. Clay for No. 20, **Border Chieftain**; T. Darrell for No. 22, **Dan**; W. C. Henderson for No. 27, **Edwine.**

Class 3.—*Hunter Mares or Geldings, foaled in* 1886 *or* 1887.[1] [25 entries, 7 absent.]

Light Weights up to 12 Stone.

46 I. (£25.)—Henry Custance, Oakham, for **The Knight**, bay gelding, foaled 1887, bred by Mr. Teale, Leeds; *s.* Knight of the Launde, *d. by* Master Bagot.

54 II. (£10.)—R. D. Levett, Dunchurch, Warwickshire, for **Laddie**, brown gelding, foaled 1886, bred by J. Weston, Dunchurch; *s.* Excelsior.

52 III. (£5.)—J. Horton, Moseley, Birmingham, for **Paragon**, bay gelding, foaled 1886, breeder unknown; *s.* Lord Malden.

62 R. N. & H. C.—Lord Willoughby de Broke, Kineton, for **Blue Devil.**

Class 4.—*Hunter Mares, foaled in* 1888.[1] [11 entries, 1 absent.]

71 I. (£25.)—J. H. Stokes, Gt. Bowden, Market Harborough, for **May Queen**, bay, breeder unknown; *s.* King of the Forest, *d. by* Harkaway.

65 II. (£10.)—A. J. Brown, Almholme, Doncaster, for **Miss O'Connell**, chestnut, bred by Mr. O'Connell, Mallow, Co. Cork; *s.* Liddesdale, *d. by* Zepherus.

66 III. (£5.)—Gilbert Greenall, Walton Hall, Warrington, for **Dorothy** 319, chestnut, bred by late James Martin, Wainfleet; *s.* Fabius, *d.* Yorkshire Lassie 141 *by* The Mallard.

73 R. N. & H. C.—J. E. Tabor, Bovingdon Hall, Braintree, for **Miss Lewis.**

Class 5.—*Hunter Geldings, foaled in* 1888.[1] [18 entries, 2 absent.]

83 I. (£25.)—Mrs. C. T. Hoare, Bignell, Bicester, for **Seakale**, bay; *s.* Soulouque, *d. by* East Coast.

78 II. (£10.)—J. S. Darrell, West Ayton, York, for **War Eagle**, chestnut, bred by R. Cannon, Hay Fell Side, Kendal; *s.* Moss Hawk, *d.* Cigar *by* Best Returns.

85 III. (£5.)—J. H. Stokes, Gt. Bowden, Market Harborough, for **Brown Study**, brown, breeder unknown; *s.* Theologian.

89 R. N. & H. C.—F. B. Wilkinson, Blyth Spital, Rotherham, for **Guardsman.** Com.—Wm. George for No. 80, **Aristocrat**; W. E. Lawson for No. 84, **Blaze.**

Class 6.—*Hunter Geldings, foaled in* 1889.[1] [12 entries, 3 absent.]

95 I. (£15.)—C. L. Campbell, Glewstone Ct., Ross, for **Selim**, brown, bred by R. E. Howard, Stockport; *s.* Sulieman, *d.* Lady Mordod 382.

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[1] Prizes given by the Warwick Local Committee.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

97 II. (£10.)—B. F. Drage, Chapel Brampton Grange, Northampton, for **Boaster**, chestnut, bred by Mr. Pike, Haversham; *s.* Brag, *d. by* Muleteer.

101 III. (£5.)—F. Nalder, East Keal Hall, Spilsby, for **General Servant**, bay, bred by Wm. Chatterton, Hallington, Louth; *s.* Fabius, *d.* Double Duty *by* General Roberts.

104 **R. N. & H. C.**—H. M. Wilson, Holmes Chapel, Cheshire, for **King Arthur**
99 **H. C.**—Wm. George, Gayton, Blisworth, for **Blue Jacket**; *s.* Jack-Tar.
Com.—Wm. Arkwright, for No. 94, **Knight Errant**; F. B. Wilkinson for No. 103, **Prime Minister**.

Class 7.—*Hunter Fillies, foaled in* 1889. [8 entries, none absent.]

105 I. (£15.)—John Beach, Foggy Furze, W. Hartlepool, for **Clematis**, bay, bred by J. S. Darrell, West Ayton, York; *s.* Bay Minster, *d.* Duckling *by* The Mallard.

108 II. (£10.)—Wm. Muzeen, Douthwaite Lodge, Kirby Moorside, for **Modesty**, chestnut; *s.* Spendthrift, *d.* Madam *by* George Osbaldeston.

112 III. (£5.)—C. H. Wailes, Rounton, Northallerton, for **Blue Empress 497**, chestnut, bred by Wm. James, Workington; *s.* Blue Grass, *d.* Polly 626 *by* Goblin.

107 **R. N. & H. C.**—B. F. Drage, Chapel Brampton Grange, for **Miss Peel**.
109 **Com.**—T. H. Royles, Dordon Hall, Tamworth, for **Duchess**.

Class 8.—*Hunter Fillies, foaled in* 1890. [12 entries, 2 absent.]

122 I. (£15.)—R. J. Mann, Acton Burnell, Salop, for **Ruby**, bay, bred by Miss A. K. King, Culworth, Banbury; *s.* Ruddigore, *d.* Leila 388 *by* Lothario.

121 II. (£10.)—John Lett, Rillington, York, for **Queenie**, bay; *s.* Gordon, *d.* Coquette 310 *by* The Mallard.

114 III. (£5.)—E. H. Dawson, Aldcliffe, Lancaster, for **Caramel**, brown, bred by T. Atkinson, Milnthorpe; *s.* Carthusian, *d.* Bonnêt.

113 **R. N. & Com.**—F. J. Coleridge Boles, for **Lady Gladys**.

Coach Horses.

Class 9.—*Coaching Stallions, foaled in* 1888, 1889, *or* 1890. [12 entries, none absent.]

126 I. (£15.)—Thomas Carr, Kirk Smeaton, Pontefract, for **Salisbury** 1888 Y.C.S.B., bay, foaled 1889; *s.* Sultan 1565, *d.* Lille *by* Ebor 135.

133 II. (£10.)—F. H. Stericker, Westgate House, Pickering, for **Leamington**, bay, foaled 1889, bred by R. Briggs, Osgodby Hall, Selby; *s.* Sir Colin Campbell 1181 Y.C.S.B., *d.* Countess *by* Prince of Wales 371.

135 III. (£5.)—John White, Appleton Roebuck, Bolton Percy, for **Knight of the Vale**, 1799 Y.C.S.B., bay, foaled 1889, bred by Wm. Codling, Eskdaleside, Sleight, Whitby; *s.* County King 110, *d. by* Statesman 662 C.B.S.B.

125 **R. N.**—F. P. Baker, Ingmanthorpe Grange, for **Ingmanthorpe Forester 2nd**.

Class 10.—*Coaching Mares and Foals.* [4 entries, none absent.]

138 I. (£15.)—T. Radcliffe, Church Aston Manor, Newport, Salop, for **Wath Belle** 338 Y.C.S.B., bay, foaled 1884 [foal *by* Sultan 667 C.B.S.B.,

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

1565 Y.C.S.B.], bred by T. Walker, Wath, Hovingham; *s.* Wonderful Lad 534, *d. by* Reaper 390.

136 **II.** (£10.)—JOHN KIRBY, Burton Fields, Stamford Bridge, York, for **Lady Mary** 265 Y.C.S.B., bay, foaled 1888 [foal *by* Prince Victor 376]; *s.* Liverton C.B.S.B., *d.* Flora 45 Y.C.S.B., *by* The Earl 474.

137 **R. N.**—T. RADCLIFFE, for **Hovingham Lass** 242 Y.C.S.B., bay, foaled 1885.

Hackneys.

Class 11.—*Hackney Stallions, foaled in* 1888, 1889, *or* 1890, *above* 15 *hands.* [5 entries, 1 absent.]

142 **I.** (£15, **& R. N. for Champion.**[1])—E. AND T. GREEN, Pool Quay, Welshpool, for **Blaze 2nd** 2376, bay, foaled 1888, bred by C. Reader, Sancton, Brough; *s.* Pioneer 1088, *d.* Jenny 680 *by* Fireaway 249.

141 **II.** (£10.)—T. FULCHER, Elmham, E. Dereham, for **Benno** 3448, black, foaled 1890, *s.* Doctor Syntax 877, *d.* Broken-legged Bess 41 *by* Rifleman 670.

143 **III.** (£5.)—GEO. JACKSON, Brandwood Ho., King's Heath, for **Melbourne** 2584, bay, foaled 1888, bred by R. Peacock & Sons, Hockwold, Brandon; *s.* Excelsior 198, *d.* Norfolk Lass 2357 *by* Norfolk Gentleman 492.

Class 12.—*Hackney Stallions, foaled in* 1888, 1889, *or* 1890, *above* 14 *hands and not exceeding* 15 *hands.* [8 entries, 2 absent.]

151 **I.** (£15, **& Champion.**[1])—J W. TEMPLE, Leyswood, Groombridge, for **Doncaster** 2949, chestnut, foaled 1888, bred by E. W. Jackson, Winestead, Hull; *s.* Danegelt 174, *d.* May Blossom 1701 *by* Lord Derby 2nd 417.

150 **II.** (£10.)—GARRETT TAYLOR, Trowse House, Norwich, for **Hackford Shales** 3650, brown, foaled 1890, bred by J. Phillippo, Hackford, Norfolk; *s.* Goldcane 2087, *d.* Hackford Lady 2797 *by* Trotting Shales 837.

146 **III.** (£5.)—ALFRED LEWIS, Heacham, Lynn, for **Harefoot** 3657, chestnut, foaled 1890, bred by F. I. Cooke, Flitcham Abbey, Lynn; *s.* Cadet 1251, *d.* Raven 839 *by* Canvasser 114.

147 **R. N. & Com.**—JOHN PITTS, Foggathorpe, Howden, for **Royal Prince** 3917.

Class 13.—*Hackney Brood Mares and Foals, above* 15 *hands.* [9 entries, 3 absent.]

157 **I.** (£15, **& R. N. for Champion.**[2])—HARRY LIVESEY, Rotherfield, Sussex, for **Countess** 2652, black, foaled 1885 [foal *by* Caractacus 2395], bred by W. Askwith, Callis Wold, Yorks.; *s.* Highflyer 1648, *d.* Callis Lass 610 *by* Denmark 177.

161 **II.** (£10.)—HENRY MOORE, Burn Butts, Cranswick, Hull, for **Sweetbriar** 514, brown, foaled 1883 [foal *by* Agility 2799]; *s.* Denmark 177, *d.* Empress 95 *by* Fireaway 249.

154 **III.** (£5.)—H.R.H. THE PRINCE OF WALES, K.G., for **New York** 1296, chestnut, foaled 1887 [foal *by* Field Marshal 2986], bred by Wm. Flanders, Mepal, Ely; *s.* Reality 665, *d.* York 370.

153 **R. N. & H. C.**—H.R.H. THE PRINCE OF WALES, K.G., for **Rosebud** 505.
155 **H. C.**—W. S. FORSTER, Gore Court, Maidstone, for **Filbert** 2060.

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[1] Gold Medal given by the Hackney Horse Society for the best Hackney Stallion.
[2] Gold Medal given by the Hackney Horse Society for the best Hackney Mare.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 14.—*Hackney Brood Mares and Foals, above* 14 *hands, and not exceeding* 15 *hands.* [8 entries, none absent.]

167 **I.** (£15, **& Champion.**[1])—HARRY LIVESEY, Rotherfield, Sussex, for **Nelly 3rd** 800, chestnut, foaled 1883 [foal *by* Evolution 2058], bred by W. Rickell, Warter, Pocklington; *s.* Denmark 177, *d.* Nelly 257 *by* St. Giles 687.

165 **II.** (£10.)—E. T. G. LINDSEY, North Pickenham, Swaffham, for **Pandora** 806, bay, foaled 1886 [foal *by* Chatterbox 2893]; *s.* Vigorous 1215, *d.* Peggy 271 *by* Little Wonder 409.

168 **III.** (£5.)—W. WATERHOUSE, Starborough Castle, Kent, for **Caprice** 1089, chestnut, foaled 1887 [foal *by* Caractacus 2395], bred by W. Flanders, Bridge Farm, Mepal; *s.* Lord of the Manor 426, *d.* Extravagance 100 *by* Highflyer 365.

162 **R. N. & H. C.**— SIR HUMPHREY F. DE TRAFFORD, BT., for **Lady Landseer.**

Class 15.—*Hackney Mares or Geldings, above* 14 *hands, up to* 15 *stone, foaled in* 1886, 1887, *or* 1888.[2] [5 entries, none absent.]

173 **I.** (£15.)—THE EARL OF LONDESBOROUGH, Londesborough Park, Yorks, for **Vanity** 2490, bay mare, foaled 1888; *s.* Candidate 920, *d.* Coquette 1059, *by* Pluto 590.

172 **II.** (£10.)—GILBERT GREENALL, Walton Hall, Warrington, for **Paul**, bay gelding, foaled 1886, breeder unknown.

174 **III.** (£5.)—W. WATERHOUSE, Starborough Castle, Kent, for **Cactus** 1043, chestnut mare, foaled 1887, bred by C. E. Cooke, Litcham, Norfolk; *s.* Cadet 1251, *d.* Crocus 75 *by* Shepherd F. Knapp.

171 **R. N. & H. C.**—A. E. EVANS, Bronwylfa, Wrexham, for **Loyalty.**

Class 16.—*Hackney Mares or Geldings, above* 14 *hands, up to* 12 *stone, foaled in* 1886, 1887, *or* 1888.[2] [12 entries, 3 absent.]

183 **I.** (£15.)—WM. POPE, Downham Market, for **Lady Isabella** 2194, bay mare, foaled 1887, bred by John Rolfe, Carleton Forehoe, Wymondham; *s.* Confidence 158, *d.* Jenny Wren No. 269 Inspected F.S.

176 **II.** (£10.)—LADY BROOKE, Easton Lodge, Dunmow, for **Queen of the Dale** 4615, bay mare, foaled 1887, bred by T. Benton, Earith, St. Ives, Hunts; *s.* Beaconsfield 49, *d.* Queen of Fashion 565 *by* Hawkestone Shales.

186 **III.** (£5.)—S. ROSE, Rugby, for **Royalty**, chestnut gelding, foaled 1888, bred by Mr. Dixon, East Cottingworth, Yorks; *s.* Prince Alfred.

180 **R. N. & H. C.**—GILBERT GREENALL, for **Lady Alice 2nd**; *s.* Lord Derby 2nd.

184 **Com.**—T. ROBERTS, 41 Ranelagh St., Liverpool, for **Lady Sefton.**

Ponies.

Class 17.—*Pony Stallions, not exceeding* 14 *hands.* [11 entries, 2 absent.]

197 **I.** (£15.)—J. WOOD, Withnell Hall, Chorley, for **Winnall George** 2440, bay, foaled 1878, bred by C. W. Wilson, Rigmaden Park, Kirkby Lonsdale; *s.* Sir George 778, *d.* Lady Polo *by* Sir George 778.

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[1] Gold Medal given by the Hackney Horse Society for the best Hackney Mare.
[2] Prizes given by the Warwick Local Committee.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

189 II. (£10.)—A. W. CLARKE, Portwood Farm, Gt. Ellingham, Attleborough, for **Portwood Confidence** 3201, brown, foaled 1888; *s.* Confidence 158, *d.* Kitty *by* Prickwillow 623.

187 III. (£5.)—H.R.H. THE PRINCE OF WALES, K.G., for **Wait-a-bit**, black, foaled 1890, bred by R. Allen, Wiggenhall St. Germans, Norfolk; *s.* Confidence 158, *d.* Blackberry No. 186 Inspected F. S.

194 R. N. & Com.—W. WHITEHOUSE, for **Shropshire Lad**; *s.* Young Ashton.

Class 18.—*Pony Brood Mares and Foals, not exceeding* 14 *hands.* [13 entries, 3 absent.]

205 I. (£15.)—SIR HUMPHREY F. DE TRAFFORD, BT., Trafford Park, for **Snorer** 2456, bay, foaled 1879 [foal *by* Little Wonder 2nd 1610], bred by C. W. Wilson, Rigmaden Park, Kirkby Lonsdale; *s.* Sir George 778, *d.* The Pet.

207 II. (£10.)—H. MOORE, Burn Butts, Cranswick, Hull, for **Jinnie Wren** 2836, brown, foaled 1889 [foal *by* Caxton 2398], bred by J. R. Burnham, Frodingham Hall; *s.* Lord Derby 2nd 417, *d.* Poll *by* Sir Richard 1172.

206 III. (£5.)—E. GREEN, The Moors, Welshpool, for **Jessie** 3954, bay, foaled 1885 [foal *by* Ganymede 2076]; *s* Star of the East 798, *d.* Jenny *by* Almanza 1617.

208 R. N.—T. RADCLIFFE, Church Aston Manor, Newport, Salop, for **Jessy**.

Class 19.—*Pony Mares or Geldings, above* 13 *hands, and not exceeding* 14 *hands.*[1] [11 entries, none absent.]

219 I. (£10.)—MRS. MATHER, Grovehill, Thornhill, N.B., for **Florence** 2759, bay mare, foaled 1886, bred by G. Butcher, Litcham, Swaffham; *s.* Whissonsett Fashion 3381, *d.* Diamond *by* Little Wonder 409.

217 II. (£5.)—A. E. EVANS, Bronwylfa, Wrexham, for **Gay Jack** 2180, skewbald gelding, foaled 1886, bred by J. Mann, Hempton, Norfolk; *s.* Model 1054, *d.* Hempton Lass No. 260 Inspected F. S.

214 R. N. & H. C.—H. DAPLYN, Hindringham, for **Norfolk Model** 2358.

213 Com.—J. H. CLIFTON, Upland House, Keynsham, Som., for **The Don**.

Class 20.—*Pony Mares or Geldings, not exceeding* 13 *hands.*[1] [11 entries, 1 absent.]

232 I. (£10.)—WM. POPE, Cannon Ho., Downham Market, for **Peacock**, bay gelding, foaled 1887, bred by S. Waller, Holt; *s.* Model, *d.* Jinnie.

226 II. (£5.)—J. A. MATHER, Grovehill, Thornhill, N.B., for **Apology** 1424, chestnut mare, foaled 1883, bred by W. B. Wayman, Hillrow, Haddenham, Cambs; *s.* Magnate 1039, *d.* Welsh Pony.

233 R. N.—S. ROSE, Rugby, for **Victor**, bay gelding, foaled 1887.

Harness Horses and Ponies.

(Shown in Harness with suitable vehicles.)

Class 21.—*Harness Mares or Geldings, of any age, exceeding* 14 *hands.*[1] [12 entries, 3 absent.]

240 I. (£15.)—WM. POPE, Cannon Ho., Downham Market, for **Nelly** 2349, bay mare, foaled 1885, bred by John Bealby, Wisbech; *s.* Confidence 158, *d.* Kitty *by* Shales 746.

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[1] Prizes given by the Warwick Local Committee.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

235 **II.** (£10.)—J. H. CLIFTON, Uplands, Keynsham, for **Bay Rhum**, bay gelding, foaled 1884, breeder unknown.

234 **R. N. & H. C.**—LADY BROOKE, Easton Lodge, Dunmow, for **O-La-La.**
236 **H. C.**—SIR HUMPHREY F. DE TRAFFORD, BT., for **Duchess of Portland.**
238 **Com.**—TOM MITCHELL, Eccleshill, Bradford, for **Lady Dudley 4067.**

Class 22.—*Harness Mares or Geldings, not exceeding* 14 *hands.*[1] [6 entries, none absent.]

249 **I.** (£15.)—WM. POPE, Cannon Ho., Downham Market, for **Magpie 228**, black & white mare, foaled 1878, bred by Mr. Cooke, Litcham, Norfolk; *s.* Confidence 1743, *d.* Spot 237 *by* Premier.

246 **II.** (£10.)—BUTCHER & THOMAS, Bedminster Mews, Bristol, for **Valentine**, dun mare, foaled 1888, breeder unknown; *s.* Welsh Flyer.

247 **R. N. & Com.**—SIR HUMPHREY F. DE TRAFFORD, BT., for **Miss Johnson.**

Shires.

Class 23.—*Shire Stallions, foaled in* 1889. [19 entries, none absent.]

270 **I.** (£20, & **Champion.**[2])—J. WAINWRIGHT, Bowden Hall, Chapel-en-le-Frith, for **Bury Victor Chief** 11105, black, bred by J. Rowell, Bury, Hunts; *s.* Prince Victor 5287, *d.* Bury Daisy *by* Chatteris Le Bon, 3023.

253 **II.** (£10.)—WM. ARKWRIGHT, Sutton Scarsdale, Chesterfield, for **Scarsdale Rocket** 12249, black; *s.* Royal Spark 4659, *d.* Scarsdale Depper *by* Champion 419.

255 **III.** (£5.)—J. A. BARRS, Nailstone Stud Farm, Hinckley, for **Nailstone Challenger** 11925, bay, bred by J. Mount, Bagworth, Leicester; *s.* Big Ben 3459, *d.* Smiler *by* Simon Pure 2018.

269 **R. N. & H. C.**—P. A. MUNTZ, M.P., Dunsmore, Rugby, for **Dunsmore Barrier.**
259 **H. C.**—CANNOCK AGRICULTURAL CO., LTD., for **Cannock Brandon 11132.**
Com.—CANNOCK AGRICULTURAL CO., LTD., for No. 258, **Hatherton II.**; H. F. LOCKE-KING for No. 267, **British Flag III**; P. A. MUNTZ, M.P., for No. 268, **Dunsmore Bounding Willow.**

Class 24.—*Shire Stallions, foaled in* 1890. [20 entries, 7 absent.]

273 **I.** (£20, & **R. N. for Champion.**[2])—LORD BELPER, Kingston Hall, Derby, for **Burgundy** 12862, brown, bred by Capt. H. C. Holland, Marchington Hall, Uttoxeter; *s.* Harold 3703, *d.* Gipsy *by* Nonpareil 2470.

277 **II.** (£10.)—THE EARL OF ELLESMERE, Worsley Hall, Manchester, for **Duke of Worsley** 13002, bay; *s.* Lancashire Lad II. 6031, *d.* Bellona *by* Garnet 2787.

272 **III.** (£5.)—J. A. BARRS, Nailstone Stud Farm, Hinckley, for **Nailstone Royal Stamp** 13372, brown, bred by F. Wollaston, Shenton Hall, Nuneaton; *s.* Big Ben 3459, *d.* *by* Canute 2736.

282 **R. N. & H. C.**—WALTER GILBEY, for **Saxon Conqueror** 13560.
H. C.—JOHN PARNELL for No. 287, **Rokeby Rajah**; T. K. RYLANDS for No. 289, **Nailstone Royal Banner.**

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[1] Prizes given by the Warwick Local Committee.
[2] Gold Medal given by the Shire Horse Society for the best Shire Stallion.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Com.—CANNOCK AGRICULTURAL CO., LTD., for No. 276, **Cannock Garfield**; WM. HOLLINS, for No. 283, **Calwich Marksman**; P. A. MUNTZ, M.P., for No. 285, **Dunsmore Banquet**; T. PEARSON, for No. 288, **Parkside.**

Class 25.—*Shire Stallions, foaled in* 1891. [16 entries, 3 absent.]

303 **I.** (£20.)—MRS. PERRY-HERRICK, Beau Manor Park, Loughborough, grey; *s.* Harold 3703, *d.* Rose *by* Warrior 2689.

298 **II.** (£10.)—J. J. LEES, Woolow, Buxton, for **Pictor Marmion**, chestnut; *s.* Marmion II. 9885, *d.* Black Bonny *by* Royal Albert 1885.

302 **III.** (£5.)—T. PEARSON, Natcby, Garstang, for **Shire's Standard**, bay, bred by Mrs. Singleton, Salwick, Preston; *s.* Scylax 8177, *d. by* Marshal 2835.

293 **R. N. & H. C.**—CANNOCK AGRICULTURAL CO., LTD., Cannock, chestnut.
H. C.—J. P. CROSS, for No. 294, **Catthorpe Gold**; WALTER GILBEY, for No. 296, **Tudor Chief.**

Class 26.—*Shire Mares and Foals.* [14 entries, 4 absent.]

312 **I.** (£20, & **Champion.**[1])—THE EARL OF ELLESMERE, Worsley Hall, Manchester, for **Princess Louisa**, brown, foaled 1885 [foal *by* Vulcan 4145], bred by John Sargeant, Cheddleton, Staffs; *s.* Royal Albert 1885, *d. by* Champion Hero 7007.

311 **II.** (£10.)—J. P. CROSS, Catthorpe Towers, Rugby, for **Mavourneen**, bay, foaled 1888 [foal *by* Catthorpe Conqueror 9106]; *s.* Harold 3703, *d.* Kate *by* Active 51.

308 **III.** (£5.)—WM. BOUCH, Ashorne, Warwick, for **Wildflower**, brown, foaled 1884 [foal *by* Hindlip Champion 9584]; *s.* Reality 2882, *d.* Hitchin Flower *by* Tom of the Shires 2682.

314 **R. N. & H. C.**—THE EARL OF ELLESMERE, for **Trinket**; *s.* Esquire 2774.
H. C.—JAMES BLYTH for No. 307, **Moulton Fantastic**; DANIEL CRAWFORD, for No. 310, **Mimms Maggie.**
Com.—JOHN CONCHAR, for No. 309, **Flower of May.**

Class 27.—*Shire Fillies, foaled in* 1889. [12 entries, 3 absent.]

322 **I.** (£15, & **R. N. for Champion.**[1])—WM. BOUCH, Ashorne, Warwick, for **Cornflower**, black; *s.* Prince William 3956, *d.* Wildflower *by* Reality 2882.

324 **II.** (£10.)—A. B. FREEMAN-MITFORD, C.B., Batsford Park, Moreton-in-Marsh, for **Minnehaha**, bay; *s.* Laughing Stock 4516, *d.* Horbling Beauty *by* Honest Tom 3731.

328 **III.** (£5.)—P. A. MUNTZ, M.P., Dunsmore, Rugby, for **Dunsmore Bracelet**, brown, bred by J. S. Hack, Crowland, Peterborough; *s.* The Boy 3358, *d. by* Stonton 2065.

329 **R. N. & H. C.**—JOHN PARNELL, Rugby, for **Rokeby Nectarine**, bay.
H. C.—THE EARL OF ELLESMERE, for No. 323, **Pink of Perfection**; LORD HINDLIP, for No. 326, **Hindlip Lady.**

Class 28.—*Shire Fillies, foaled in* 1890. [22 entries, 4 absent.]

337 **I.** (£15.)—S. B. CHADWICK, Crofton Lodge, Runcorn, for **Hawthorndale**, bay, bred by J. Hoggarth, Slyne, Lancs; *s.* Franklin 3090, *d.* Hilda *by* Ruler 4000.

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[1] Gold Medal given by the Shire Horse Society for the best Shire Mare or Filly.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

343 **II.** (£10.)—T. HARDY, Mere Hall Farm, Knutsford, for **Mere Duchess**, bay, bred by F. W. Griffin, Boro' Fen, Peterborough; *s.* Salisbury 5324, *d.* Boro' Duchess *by* Thumper Junior 2500.

348 **III.** (£5.)—P. A. MUNTZ, M.P., Dunsmore, Rugby, for **Gloaming**, bay, bred by H.R.H. the Prince of Wales, K.G.; *s.* Harold 3703, *d.* Glime *by* Staunton Hero 2918.

335 **R. N. & H. C.**—LORD BELPER, Kingston Hall, Derby, for **Princess**.

H. C.—J. P. CROSS, for No. 338, **Catthorpe Clematis**; SIR HUMPHREY DE TRAFFORD, BT., for No. 339, **Thrift**; C. E. GALBRAITH, for No. 341, **Gaudy Poll**; LORD HINDLIP, for No. 345; T. H. MILLER, for No. 347, **Marina**.

Com.—THE EARL OF BRADFORD, for No. 336, **Charming Kate**; WALTER GILBEY, for No. 342, **Dunsmore Balance**; J. WAINWRIGHT, for No. 352, **Quarrelsome**.

Class 29.—*Shire Fillies, foaled in* 1891. [26 entries, 8 absent.]

373 **I.** (£15.)—P. A. MUNTZ, M.P, Dunsmore, Rugby, for **Cui-Bono**, brown, bred by J. Salt, Longnor, Staffs; *s.* Regent II. 6316, *d.* Berry *by* Lincolnshire Lad II. 1365.

378 **II.** (£10.)—W. R. WARDLE, Weston Underwood, Derby, for **Weston Lassie**, bay; *s.* Shottle Lad 10398, *d.* West *by* Brailsford Hero 3484.

362 **III.** (£5.)—FRED CRISP, New Southgate, N., for **Southgate Black Duchess**, black, bred by T. Gee, jun., Gothic Ho., Thorney, Cambs; *s.* Sir James II. 6393, *d.* Gipsy *by* Master of Arts III. 3220.

368 **R. N. & H. C.**—WALTER GILBEY, Elsenham Hall, Essex, for **Tudor Pink**.

H. C.—WM. ARKWRIGHT, for No. 355, **Scarsdale Maroon**; SIR W. H. SALT, BT. for No. 376, **Maplewell Eileen**.

Com.—JAMES BLYTH, for No 356, **Blythwood Duchess**; THE EARL OF ELLESMERE, for No. 364, **Vesta of Worsley X.**; H. F. LOCKE-KING, for No. 369, **Ashbourne Lady**.

Clydesdales.

Class 30.—*Clydesdale Stallions, foaled in* 1889. [5 entries, 1 absent.]

381 **I.** (£20, & Champion, £20.[1])—HER MAJESTY THE QUEEN, Flemish Farm, Windsor, for **Macquhae** 8827, bay, bred by the late S. Campbell's Trustees, Rattra, Borgue, N.B.; *s.* Macgregor 1487, *d.* Nannie of Rattra 1075 *by* Superior 837.

382 **II.** (£10.)—LORDS A. & L. CECIL, Orchardmains, Tunbridge, for **Crown of Royalty** 9177, brown, bred by W. Osler, Meams, Kirriemuir, N.B.; *s.* Garnet Cross 1662, *d.* Kate of Meams 7701 *by* Blantyre 1068.

384 **III.** (£5.)—SIR E. G. LODER, BT., Whittlebury, Towcester, for **Duke of Whittlebury** 9192, bay, bred by John Williamson, Allonby; *s.* Schulemaister 3166, *d.* Cherry Blossom 9300 *by* Challenger 1088.

385 **R. N. & Com.**—F. T. STANLEY, Thurlaston, Warwickshire, for **Brigadier** 9146, bay.

Class 31.—*Clydesdale Stallions, foaled in* 1890. [3 entries, none absent.]

387 **I.** (£20, & R. N. for Champion.[1])—WM. GRAHAM, Eden Grove, Penrith, for **Sir Harry** 9411, brown, bred by G. Ferguson, Lumphart, N.B.; *s.* Royalist 6242, *d.* Pandora 3242 *by* Boydston Boy 111.

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[1] Given by the Clydesdale Horse Society for the best Clydesdale Stallion.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

388 II. (£10.)—W. Montgomery, Banks, N.B., for **Meridian** 9323, brown, bred by Mrs. Wilson, Drums, Carluke; *s.* Knight o' Lothian 4489, *d.* Darling 6870 *by* Lord Clyde 1193.

386 III. (£5.)—Lords A. & L. Cecil, Orchardmains, Tunbridge, for **Prince Eddy**, bay, bred by Sir J. A. Hay, Bart., King's Meadows, Peebles; *s.* Prince of Albion 6178, *d.* Lady Gallant 10658 *by* Top Gallant 1850.

Class 32.—*Clydesdale Mares and Foals.* [7 entries, 3 absent.]

391 I. (£20.)—Wm. Graham, Eden Grove, Penrith, for **Nelly Milton** 6204, brown, foaled 1883 [foal *by* Prince of Albion 6178], bred by W. Graham, Milton, N.B.; *s.* Macgregor 1487, *d.* Trim 1286 by Gladstone 333.

390 II. (£10.)—Viscount Emlyn, Golden Grove, Carmarthen, for **Bell** 10565, brown, foaled 1887 [foal *by* Clan McAlpine 8527], bred by A. McDowall, Harlaw, Balerno, N.B.; *s.* Obedience 2313, *d.* Harlaw Maggie 5574 *by* Abbey Prince 2.

393 III. (£5.)—Sir E. G. Loder, Bt., Whittlebury, Towcester, for **Maid of the Mist** 2918, bay, foaled 1877 [foal *by* Duke of Whittlebury 9192], bred by J. Fell & Sons, Whitrigg House, Kirkbride; *s.* Prince of Kirkbean 1269, *d.* Scot *by* Lord Clyde 1193.

395 R. N.—F. T. Stanley, Thurlaston, Warwickshire, for **Undine**, bay.

Class 33.—*Clydesdale Fillies, foaled in* 1889. [5 entries, 1 absent.]

396 I. (£15, & R. N. for Champion.[1])—Lords A. & L. Cecil, Orchardmains, Tunbridge, for **Carillon**, bay; *s.* Claymore 3522, *d.* Campanella 4180 *by* Druid 1120.

397 II. (£10.)—Lords A. & L. Cecil, for **Carissima**, bay; *s.* Claymore 3522, *d.* Darling 1093 *by* Topsman 886.

398 III. (£5.)—The Marquis of Londonderry, K.G., Seaham Hall, for **Woodbine**, bay; *s.* The Regent 5408, *d.* Winifred 8677 *by* Castlereagh.

399 R. N.—G. Rodger, Newton Bank, Preston Brook, for **The Banshee**.

Class 34.—*Clydesdale Fillies, foaled in* 1890. [9 entries, 3 absent.]

407 I. (£15, & Champion, £20.[1])—L. Pilkington, Cavens, Dumfries, for **Queen of the Roses**, bay, bred by J. Gilmour, Montrave, Fifeshire; *s.* Prince of Albion 6178, *d.* Moss Rose 6203 *by* Prince Charlie 634.

405 II. (£10.)—Wm. Graham, Eden Grove, Penrith, for **Lothian Lass**, brown, bred by W. L. Stewart, Stanmore, Lanark; *s.* Knight o' Lothian 4489, *d.* Maggie 11075 *by* Young Rantin' Robin 1020.

402 III. (£5.)—Lords A. & L. Cecil, Orchardmains, Tunbridge, for **Queen Bess**, bay, bred by T. M. Gordon, Meikle Cocklick, Dalbeattie; *s.* Lothian King 6985, *d.* Brita 8444 *by* Macgregor 1487.

401 R. N.—Lords A. & L. Cecil, for **Compensation**, brown; *s.* Claymore.

Suffolks.

Class 35.—*Suffolk Stallions, foaled in* 1889. [7 entries, none absent.]

413 I. (£20.)—I. Pratt & Son, Foxboro' Hall, Melton, Woodbridge, for **Eclipse** 2010, chestnut, bred by E. Capon, Aldeby, Beccles; *s.* Cupbearer 3rd 566, *d.* Grace 335 *by* Viceroy 570.

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[1] Given by the Clydesdale Horse Society for the best Clydesdale Mare or Filly.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

415 II. (£10.)—A. J. SMITH, Rendlesham, Woodbridge, for **Democrat** 2044, chestnut, bred by W. Davy, Athelington, Suffolk; *s.* Prosperity 1843, *d.* Diamond *by* Wantisden Duke 534.

412 III. (£5.)—THE DUKE OF HAMILTON & BRANDON, K.T., Easton Park, Suffolk, for **Wedgewood 2nd** 2045, chestnut, bred by B. A. Posford, Falkenham; *s.* Smith's Wedgewood 1749, *d.* Diamond *by* Royalty 1339.

416 R. N. & Com.—A. J. SMITH, Rendlesham, for **Fauntleroy** 2132.

410 Com.—WM. BYFORD, Glemsford, for **Yeoman** 2076; *s.* Dreadnought 1462.

Class 36.—*Suffolk Stallions, foaled in* 1890. [6 entries, 2 absent.]

419 I. (£20.)—I. PRATT & SON, Foxboro' Hall, Melton, Woodbridge, for **Earl** 2208, chestnut, bred by T. G. Cook, Saxtead Lodge, Suffolk; *s.* Bar None 1803, *d.* Darby *by* Cupbearer 2nd 542.

418 II. (£10.)—R. EDGAR, Knight's Hill, Cockfield, Sudbury, for **Hardware** 2249, chestnut, bred by R. Porter, Rushmere, Suffolk; *s.* Wedgewood 1749, *d.* Duchess 2027 *by* Royalty 1339.

422 III. (£5.)—HORACE WOLTON, Newbourn Hall, Woodbridge, for **Chieftain's Champion** 2162, chestnut; *s.* Wolton's Chieftain 1354, *d.* Pearl 1621 *by* Prince Royal 1338.

420 R. N. & Com.—W. WILSON, Baylham Hall, Ipswich, for **Emperor of Butley**.

Class 37.—*Suffolk Mares and Foals.* [5 entries, 3 absent.]

424 I. (£20.)—R. EDGAR, Knight's Hill, Cockfield, Sudbury, for **Prattle** 2213, chestnut, foaled 1887 [foal *by* Rattle 1776], bred by C. Kersey, Framsden, Suffolk; *s.* Cupbearer 3rd 566, *d.* Brag 1895 *by* Statesman 657.

Class 38.—*Suffolk Fillies, foaled in* 1889. [6 entries, 2 absent.]

430 I. (£15.)—THE DUKE OF HAMILTON & BRANDON, K.T., Easton Park, Wickham Market, for **Queen of Trumps** 2702, chestnut, bred by C. Austin, Brandeston Hall, Wickham Market; *s.* Garrett's Cupbearer 3rd 566, *d.* Queen of Diamonds 1859 *by* Vanguard 1327.

432 II. (£10.)—W. E. S. & P. H. WILSON, Hadleigh, for **Darling** 2699, chestnut; *s.* Chieftain 1354, *d.* Duke 2260 *by* Captain 1833.

433 III. (£5.)—HORACE WOLTON, Newbourn Hall, Woodbridge, for **Matchett** 2926, chestnut, bred by B. Allen, Harkstead, Suffolk; *s.* Wolton's Chieftain 1354, *d.* Matchett *by* Emperor 120.

Class 39.—*Suffolk Fillies, foaled in* 1890. [7 entries, 1 absent.]

434 I. (£15.)—W. BYFORD, The Court, Glemsford, Suffolk, for **Lady** 3035, chestnut, bred by F. T. W. Burch, Winston, Suffolk; *s.* Vanguard 1327, *d.* Crown Jewel 132 *by* Conqueror 78.

439 II. (£10.)—W. E. S. & P. H. WILSON, Hadleigh, for **Matchett** 2982, chestnut; *s.* Clodhopper 1726, *d.* Scott 2221 *by* a colt *by* Captain 1833.

437 III. (£5.)—A. J. SMITH, Rendlesham, Woodbridge, for **Dainty Dolly** 3009, chestnut; *s.* Wedgewood 1749, *d.* Dorcas 2021 *by* Foxhall 1423.

440 R. N. & H. C.—W. E. S. & P. H. WILSON, Hadleigh, for **Smart** 2966.

Com.—WM. EVERITT, for No. 435, **Belle**; CAPT. THE HON. ALWYNE GREVILLE, for No. 436, **Grannie**.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Agricultural Horses.[1]

Class 40.—*Agricultural Geldings, foaled in* 1889, *sired by a Stallion registered in the Shire Horse Stud Book.* [5 entries, none absent.]

443 I. (£10.)—H. LAWSON, Manor House, Skirpenbeck, Yorks, for **Briton**, chestnut, bred by J. D. Lawson, Sutton-on-Forest, Easingwold; *s.* Rule Britannia 8136, *d. by* Bar None 2388.

441 II. (£5.)—SIR HUMPHREY DE TRAFFORD, BT., Trafford Park, Manchester, for **Grange**, roan, bred by W. Jonas, Heydon Bury; *s.* Spark 2497.

445 **R. N. & H. C.**—LORD WANTAGE, K.C.B., V.C., Lockinge, Berks, for **Stilton.**

Class 41.—*Agricultural Geldings, foaled in* 1890, *sired by a Stallion registered in the Shire Horse Stud Book.* [2 entries, none absent.]

446 I. (£10.)—A. M. TREE, Ashorne Hill, Leamington, for bay, bred by Mr. Beck, Ashorne; *s.* Bold William 4265.

447 II. (£5.)—A. M. TREE, roan, bred by Mr. Beck, Ashorne; *s.* Reality 2882.

CATTLE.

Shorthorns.

Class 42.—*Shorthorn Bulls, calved in* 1886, 1887, 1888, *or* 1889. [21 entries, 2 absent.]

467 I. (£15, **& Champion**, £25.[2])—H. WILLIAMS, Moor Park, Harrogate, for **Major** 59419, red & white, born Jan. 23, 1889, bred by H.M. the Queen; *s.* Field Marshal 47870, *d.* Molly Lind 2nd *by* Goldfinder 47967.

468 II. (£10.)—J. DEANE WILLIS, Bapton Manor, Codford, for **Count Lavender** 60545, roan, born Mar. 3, 1889, bred by W. Duthie, Collynie, Tarves, N.B.; *s.* Norseman 56233, *d.* Sweet Lavender *by* Earl of March, 33807.

450 III. (£5.)—H. T. COOKSON, Sturford Mead, Warminster, for **Judge of Assize** 59163, roan, born Apr. 13, 1888, bred by A. Cruickshank, Sittyton, N.B.; *s.* Standard Bearer 55096, *d.* Duchess of Glo'ster 21st *by* Barmpton Prince 32995.

454 **R. N. & H. C.**—JOHN HANDLEY, Green Head, Milnthorpe, for **St. Clair.**

H. C.—JOHN BARNES for No. 448, **Bouncing Boy**; D. C. BRUCE for No. 449, **Cock o' the North**; JOHN HANDLEY for No. 453, **Duke of Fife.**

Com.—POTTER & CO., for No. 460, **Proconsul Pippin**; ROBT. THOMPSON, for No. 465, **Merry Beau.**

Class 43.—*Shorthorn Bulls, calved in* 1890. [17 entries, 4 absent.]

469 I. (£15, **& R. N. for Champion.**[2])—HER MAJESTY THE QUEEN, The Prince Consort's Shaw Farm, Windsor, for **Fairfax** 60792, roan, born Jan. 5; *s.* Field Marshal 47870, *d.* Fraulein *by* Admiral 39353.

470 II. (£10.)—F. W. BOND, Wargrave Hill, Henley-on-Thames, for **Rosedale Farmer** (vol. xxxvii. p. 312), roan, born Sept. 12, bred by C. W. Brierley, Rosedale, Tenbury; *s.* Bangle 58406, *d.* May Carew *by* Baronet 52459.

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[1] Prizes given by the Warwick Local Committee.
[2] Given by the Shorthorn Society for the best Male Shorthorn.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

477 **III.** (£5.)—MASKILL & STRICKLAND, Brandsby, Easingwold, for **Rob Roy** (vol. xxxvii. p. 533), red and little white, born Aug. 14; *s.* Robin Hood 57997, *d.* Derwent Princess *by* Blairmore 49156.

478 **R. N. & H. C.**—ROBERT PINDER, Whitwell, Oakham, for **Lord Penda.**
H. C.—G. F. KING for No. 474, **Blair Athol**; THE DUKE OF PORTLAND for No. 481, **St. Serf.**
Com.—WM. GRAHAM for No. 471, **Baron Hopeful**; JOHN HANDLEY for No. 472, **Magnus**; T. WILLIS for No. 485, **Windsor's Heir.**

Class 44.—*Shorthorn Bulls, calved in* 1891. [30 entries, 5 absent.]

503 **I.** (£15.)—THE DUKE OF NORTHUMBERLAND, Alnwick Castle, for **Fairy King** (vol. xxxviii.), roan, born Mar. 1; *s.* Royal Arthur 59806, *d.* Fairy Rosebud *by* King Hal 49808.

488 **II.** (£10.)—H.R.H. THE PRINCE OF WALES, K.G., for **Broughton Lad** (vol. xxxviii.), roan, born Mar. 25; *s.* Lord Broughton 56029, *d.* Diadem 25th *by* Wolferton Knight 52378.

495 **III.** (£5.)—JOHN HANDLEY, Green Head, Milnthorpe, for **Captain Ingram** (vol. xxxviii.), roan, born Feb. 25; *s.* Ingram's Swell 57492, *d.* Hawthorn Bud *by* Royal Ingram 50374.

486 **R. N. & H. C.**—HER MAJESTY THE QUEEN, for **Red Rover.**
H. C.—R. PINDER for No. 504, **Royal Soldier**; J. DEANE WILLIS for No. 515, **Mountain Lord.**
Com.—LORD POLWARTH for No. 507, **Royal Sovereign**; T. F. ROSKRUGE for No. 509, **Ruddigore.**

Class 45.—*Shorthorn Cows (in-milk or in-calf), calved before* 1889. [7 entries, none absent.]

518 **I.** (£15 & Champion, £25.[1])—LORD POLWARTH, Mertoun House, St. Boswells, for **Truth** (vol. xxxv. p. 526), red & white, born Apr. 12, 1888; *s.* Sir Arthur Irwin 44016, *d.* Timbrel *by* Prince Stuart 45421.

519 **II.** (£10.)—LORD POLWARTH, for **Wave of Loch Leven** (vol. xxxvi. p. 599), red, born Feb. 14, 1886, calved May 23, 1892; *s.* King David 43417, *d.* Wave of Pacific *by* Rapid Rhone 35205.

516 **III.** (£5.)—C. W. BRIERLEY, Rosedale, Tenbury, for **Softlaw Rose** (vol. xxxvii. p. 630), red & white, born May 10, 1886 [calved Sept. 13, 1892], bred by J. Scott, Softlaw East Mains, Kelso; *s.* Prince Charming 50197, *d.* Fairnington Rose *by* Mountain Prince 61343.

517 **R. N. & H. C.**—WM. GRAHAM, Eden Grove, Penrith, for **Windsor's Beauty.**
H. C.—T. E. WALKER for No. 520, **Baroness 9th**; **Com.** for No. 521, **Princess Royal 8th**, and for No. 522, **Queen Mab.**

Class 46.—*Shorthorn Heifers (in-milk or in-calf), calved in* 1889. [9 entries, 3 absent.]

521 **I.** (£15.)—C. W. BRIERLEY, Rosedale, Tenbury, for **Godiva Butterfly** (vol. xxxviii.), roan, born Sept. 30, calved Jan. 2, 1892, bred by R. Thompson, Inglewood, Penrith; *s.* Beau Cumbrian 55361, *d.* Gillian Butterfly *by* Beau Benedict 42769.

530 **II.** (£10.)—T. STOKES, Warmington, Oundle, for **Gladys Waterloo** (vol. xxxvi. p. 671), roan, born July 4, calved Oct. 1, 1891; *s.* Gladys Hero 2nd 55801, *d.* Waterloo of Claife *by* Lord Elderbeck 2nd 51573.

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[1] Given by the Shorthorn Society for the best Female Shorthorn.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

523 **III.** (£5.)—HER MAJESTY THE QUEEN, The Prince Consort's Shaw Farm, Windsor, for **Rachel** (vol. xxxvi. p. 240), roan, born Jan. 16, calved Dec. 7, 1891; *s.* Field Marshal 47870, *d.* Ruth 210th *by* King Bolivar 48096.

531 **R. N. & Com.**—GEO. THOMPSON, Wroxall, Warwick, for **Fairy Duchess 21st.**
529 **Com.**—J. J. SHARP, Broughton, Kettering, for **Oxford Cherry.**

Class 47.—*Shorthorn Heifers, calved in* 1890. [25 entries, 7 absent.]

533 **I.** (£15 & **R. N. for Champion.**[1])—HER MAJESTY THE QUEEN, The Prince Consort's Shaw Farm, for **Rosemary** (vol. xxxvii. p. 241), roan, born Jan. 10; *s.* Field Marshal 47870, *d.* Ruth 210th *by* King Bolivar 48096.

553 **II.** (£10.)—ROBERT THOMPSON, Inglewood, Penrith, for **Margaretta Millicent** (vol. xxxvii. p. 685), roan, born Oct. 3; *s.* Beau Champion 56930, *d.* Marguerite Millicent *by* Royal Baron 50354.

540 **III.** (£5.)—E. ECROYD, Low House, Armathwaite, Cumberland, for **Well Heads Rose 14th,** roan, born Sept. 18; *s.* Duke of Chatsworth 3rd 57185, *d.* Well Heads Rose 13th (vol. xxxvi. p. 379) *by* Duke of Holker 38153.

536 **R. N. & H. C.**—C. W. BRIERLEY, Rosedale, Tenbury, for **Rosedale Cherry.**
H. C.—HER MAJESTY THE QUEEN for No. 532, **Pearl**; C. W. BRIERLEY for No. 535, **Princess**; J. J. SHARP for No. 550, **Oxford Rosette 5th**; J. DEANE WILLIS for No. 555, **Golden Mary 2nd,** and No. 556, **Vinolia.**
Com.—G. & H. BICKFORD for No. 534, **Cameo**; C. W. BRIERLEY for No. 537, **Rosedale Venus.**

Class 48.—*Shorthorn Heifers, calved in* 1891. [25 entries, 10 absent.]

580 **I.** (£10.)—R. STRATTON, The Duffryn, Newport, Mon., for **Timbrel 23rd,** roan, born Mar. 26; *s.* Medallion 56175, *d.* Timbrel 12th (vol. xxxvii. p. 668) *by* Victor 52297.

563 **II.** (£5.)—C. W. BRIERLEY, Rosedale, Tenbury, for **Rosedale Minerva** (vol. xxxviii.), roan, born July 14; *s.* Harry Ingram 54417, *d.* Rosedale Minnie *by* Rosedale Emperor 54939.

557 **R. N. & H. C.**—HER MAJESTY THE QUEEN, for **Rowena** (vol. xxxviii.)
569 **H. C.**—R. & G. HARRISON, Underpark, Lealholm, Yorkshire, for **Warfare.**
Com.—E. ECROYD for No. 565, **Waterloo Duchess 12th**; THE EARL OF FEVERSHAM for No. 568, **Duchess of York 13th**; T. STOKES for No. 578, **Lady Dennison 22nd.**

Herefords.

Class 49.—*Hereford Bulls, calved in* 1886, 1887, 1888, *or* 1889. [7 entries, none absent.]

583 **I.** (£15 & **Champion,** £15.[2])—J. H. ARKWRIGHT, Hampton Court, Leominster, for **Spring Jack** 14191, born Jan. 2, 1888; *s.* Hilarity 8734, *d.* Lively 10th *by* Conjuror 5264.

582 **II.** (£10 & **R. N. for Champion.**[2])—J. H. ARKWRIGHT, for **Rose Cross 2nd** 14865, born Jan. 21, 1889; *s.* Iroquois 3rd 13147, *d.* Curley 23rd *by* Rose Cross 7237.

585 **III.** (£5.)—W. H. COOKE, Shelsley Kings, Worcester, for **Grove Wilton 4th** 13846, born Mar. 12, 1888; *s.* Grove Wilton 3rd 11295, *d.* Leinthall Symmetry *by* Downton Grand Duke 5878.

588 **R. N. & H. C.**—JOHN PRICE, Court Ho., Pembridge, for **Grove Wilton 2nd.**

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[1] Given by the Shorthorn Society for the best Female Shorthorn.
[2] Given by the Warwick Local Committee for the best Male Hereford.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 50.—*Hereford Bulls, calved in* 1890. [5 entries, 2 absent.]

591 I. (£15.)—A. E. HUGHES, Wintercott, Leominster, for **Albion** 15027, born Jan. 5, bred by N. F. Moore, Sutton, Hereford; *s.* Bruce 13646, *d.* Milenda *by* Recorder 7205.

593 II. (£10.)—H. W. TAYLOR, Showle Court, Ledbury, for **Sainfoin** 15655, born Feb. 8; *s.* Admiral 12797, *d.* Echo *by* Franklin 6961.

592 III. (£5.)—JOHN PRICE, Court Ho., Pembridge, for **Prince of Wales** 15586, born Apr. 2; *s.* Pioneer 14025, *d.* Pansy Blossom *by* Garfield 4th 11251.

Class 51.—*Hereford Bulls, calved in* 1891. [15 entries, 6 absent.]

602 I. (£15.)—REES KEENE, Llanvihangel Court, Chepstow, for **Ruler** (vol. xxiii.), born Jan. 7; *s.* Pembridge 10387, *d.* Blanche 2nd *by* Return 6639.

607 II. (£10.)—H. W. TAYLOR, Showle Court, Ledbury, for **Astrakhan** (vol. xxiii.), born Feb. 2; *s.* Cavalier 9682, *d.* Echo *by* Franklin 6961.

595 III. (£5.)—THE EARL OF COVENTRY, Croome Ct., Severn Stoke, for **Gargantua**, born Jan. 12; *s.* Royal Ruler 13406, *d.* Garc à Vous *by* Adonis 10926.

594 R. N. & H. C.—J. H. ARKWRIGHT, Hampton Ct., Leominster, for **Happy Hampton.**

599 H. C.—R. GREEN, for **Pioneer.** 608 Com.—H. W. TAYLOR, for **Cossack.**

Class 52.—*Hereford Cows (in-milk or in-calf), calved before* 1889. [3 entries, 1 absent.]

609 I. (£15 & R. N. for Champion.[1])—THOMAS FENN, Stonebrook Ho., Ludlow, for **Bravura** (vol. xxi. p. 339), born May 17, 1886, calved Feb. 27, 1892, bred by the Earl of Coventry; *s.* Good Boy 7668, *d.* Bertha *by* Commander 4452.

611 II. (£10.)—FREDERICK PLATT, Barnby Manor, Newark, for **Pet** (vol. xx.), born May 7, 1883, calved May 5, 1892, bred by John Price, Pembridge; *s.* Hotspur 7028, *d.* Prettymaid 9th *by* Grand Duke 5342.

Class 53.—*Hereford Heifers (in-milk or in-calf), calved in* 1889. [5 entries, 1 absent.]

612 I. (£15.)—THE EARL OF COVENTRY, Croome Court, Severn Stoke, for **Golden Fleece**, born Jan. 27, calved March 20, 1892; *s.* Rare Sovereign 10499, *d.* Golden Fortune *by* Adelbert 8185.

613 II. (£10.)—THOMAS FENN, Stonebrook Ho., Ludlow, for **Downton Hermia** (vol. xxi. p. 340), born Mar. 24, calved Mar. 22, 1892; *s.* Bourton 11005, *d.* Hermia *by* Defender 5866.

614 III. (£5.)—THOMAS FENN for **Fine Lady** (vol. xxi. p. 339), born Nov. 29; *s.* Bourton 11005, *d.* Bit of Fashion *by* Auctioneer 5194.

615 R. N. & H. C.—E. S. GODSELL, Stroud, for **Sunbeam.**

Class 54.—*Hereford Heifers, calved in* 1890. [5 entries, 1 absent.]

620 I. (£15 & Champion, £15.[1])—RICHARD GREEN, The Whittern, Kington, for **Perilla** (vol. xxii. p. 385), born Jan. 8; *s.* Whittern Grove 10843, *d.* Miss Perfection *by* Lord Wilton 4740.

618 II. (£10.)—COL. R. BRIDGFORD, C.B., Kinnersley, Hereford, for **Sybil** (vol. xxii. p. 259), born Jan. 10; *s.* Torro 7313, *d.* Dairymaid (vol. xxi. p. 237) *by* Ruby 6659.

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[1] Given by the Warwick Local Committee for the best Female Hereford.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

621 **III.** (£5.)—N. F. MOORE, Pantalls, Sutton, Hereford, for **Lady Rufus** (vol. xxii. p. 518), born Jan. 21; *s.* Rufus 14135, *d.* Ladylike *by* Lion 6533.

619 **R. N. & H. C.**—T. FENN, Stonebrook Ho., Ludlow, for **Evening Star.**

Class 55.—*Hereford Heifers, calved in* 1891. [14 entries, 3 absent.]

632 **I.** (£10.)—RALPH PALMER, Lodge Farm, Nazeing, for **Whiskey**, born Mar. 5; *s.* Crown Prince 8464, *d.* Wellingtonia 4th *by* Landlord 7073.

624 **II.** (£5.)—JOHN CAVE, Wall End, Monkland, Leominster, for **New Year's Gift** (vol. xxiii.), born Jan. 1; *s.* Stockton Wilton 8078, *d.* Winnie 2nd *by* Comet 4449.

630 **R. N. & H. C.**—A. E. HUGHES, Wintercott, Leominster, for **Lucinda 2nd.**
Com.—COL. R. BRIDGFORD, C.B., for No. 623, **Princess 2nd**; THE EARL OF COVENTRY, for No. 625, **Varnish 2nd**; JOHN PRICE, for No. 634, **Princess Elizabeth.**

Devons.

Class 56.—*Devon Bulls, calved in* 1887, 1888, *or* 1889. [6 entries, 2 absent.]

640 **I.** (£15.)—SIR WM. WILLIAMS, BT., Heanton, Barnstaple, for **Pretty Middling** 2859, born Oct. 18, 1889, bred by Viscount Falmouth, Tregothnan, Probus; *s.* Lord Wolseley 2063, *d.* Quadrille 5800 *by* Sirloin 1443.

636 **II.** (£10.)—JOHN HOWSE, Stamborough, Taunton, for **Lord Stamborough** 2630, born Dec. 23, 1889; *s.* The Vicar 2156, *d.* Daisy 4th 5224 *by* Nelson 1413.

638 **III.** (£5.)—WM. LETHBRIDGE, Wood, Okehampton, for **Bravo Tempter 2nd** 2543, born Feb. 27, 1889, bred by John Tremayne, Sydenham, Lew Down, Devon; *s.* Bravo 1686, *d.* Temptress 7th 5000 *by* Duke of Flitton 10th 1074.

637 **R. N. & H. C.**—JOHN HOWSE, for **Shamrock** 2311; *s.* Druid 1317.

Class 57.—*Devon Bulls, calved in* 1890. [4 entries, 1 absent.]

641 **I.** (£15.)—J. F. R. MORRIS, Prixford House, Marwood, Barnstaple, for **Country Gentleman** 2741, born May 13; *s.* Primrose Duke 2296, *d.* Lady Mary *by* Duke 1320.

642 **II.** (£10.)—J. C. WILLIAMS, Caerhays Castle, St. Austell, for **Doncaster** (vol. xiv.), born Jan. 16; *s.* Duke of Flitton 17th 1544, *d.* Dowager 8784 *by* Bravo 1686.

643 **R. N. & Com.**—J. C. WILLIAMS, Werrington Park, Launceston, for **Teuton.**

Class 58.—*Devon Bulls, calved in* 1891. [4 entries, none absent.]

645 **I.** (£10.)—F. J. COLERIDGE BOLES, Baraset, Alveston, Stratford-on-Avon, for **Dragoman** 2952, born Mar. 28, bred by the late W. H. Punchard, Bourton Hall, Totnes; *s.* The Vicar 2156, *d.* Dorothy Draggletail 2nd 5784 *by* Sir Michael 1646.

648 **II.** (£5.)—J. C. WILLIAMS, Werrington Pk., Launceston, for **Applecross** 2921, born Jan. 9; *s.* Marmaduke 2280, *d.* Apple Blossom 7973 *by* Tempter 1851.

R. N. & H. C.—ALFRED BOWERMAN, for No. 646, **Starlight.**
Com.—J. F. R. MORRIS, for No. 647, **Masterman.**

Class 59.—*Devon Cows or Heifers (in-milk or in-calf), calved before or in* 1889. [2 entries.]

650 **I.** (£15.)—SIR WM. WILLIAMS, BT., Heanton, Barnstaple, for **Fiction 2nd** 11108, born Apr. 9, 1889, calved Jan. 13, 1892; *s.* Foreman 2nd 1969, *d.* Fiction 9352 *by* Duke of Flitton 17th 1544.

649 **R. N. & H. C.**—JOHN HOWSE, Stamborough, Taunton, for **Moss Rose 12th.**

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 60.—*Devon Heifers, calved in* 1890. [3 entries.]

651 **I.** (£15.)—John Howse, Stamborough, Washford, Taunton, for **Prolific 13th** 11409, born June 28, bred by John Farthing, Currypool, Bridgwater; *s.* Baronet 1897, *d.* Prolific 2nd 6286.

653 **II.** (£10.)—Sir Wm. Williams, Bt., Heanton, Barnstaple, for **Flame 4th** 11891, born May 26; *s.* Captain 2204, *d.* Flame *by* Duke of Flitton 17th.

652 **R. N. & Com.**—J. C. Williams, Werrington Pk., Launceston, for **Water-hen.**

Class 61.—*Devon Heifers, calved in* 1891. [3 entries.]

655 **I.** (£10.)—E. Mucklow, Whitstone Head, Holsworthy, for **Lady Ida** 12385, born Jan. 10, bred by the late W. H. Punchard, Bourton Hall, Totnes; *s.* Duke of Bourton 2581, *d.* Lady Jane 10373 *by* Champion 1696.

654 **II.** (£5.)—J. F. R. Morris, Prixford House, Marwood, Barnstaple, for **Daisy 4th** 12316, born May 1; *s.* Primrose Duke 2296, *d.* Daisy 10336 *by* Duke 1320.

656 **R. N. & H. C.**—Sir Wm. Williams, Bt., Heanton, Barnstaple, for **Daisy 7th.**

Sussex.

Class 62.—*Sussex Bulls, calved in* 1887, 1888, *or* 1889. [5 entries, 2 absent.]

658 **I.** (£15.)—W. S. Forster, Gore Court, Maidstone, for **Gondolier** 1001, born Apr. 19, 1889; *s.* Careful 741, *d.* Tidy.

659 **II.** (£10.)—C. T. Lucas, Warnham Court, Horsham, for **Lord Oxeye** 954, born Aug. 24, 1888, bred by R. Whitehead, Paddockhurst, Crawley; *s.* Golddust 11th 677, *d.* Marguerite 4066 *by* Frankenstein 4th 540.

657 **R. N.**—R. B. Aldridge, St. Leonard's Forest, Sussex, for **Standen 13th.**

Class 63.—*Sussex Bulls, calved in* 1890. [4 entries.]

I. (£15.)—Joseph Godman, Park Hatch, Godalming, for **Goldlink** 1099, born Mar. 1; *s.* Gold 815, *d.* Noble Lady 2911 *by* Napoleon 3rd 396.

664 **II.** (£10.)—W. S. Forster, Gore Court, Maidstone, for **Dogrose** 1086, born July 14; *s.* Mikado 705, *d.* Rosebud 1st 3825 *by* Frankenstein 2nd 328.

663 **R. N. & H. C.**—The Earl of Derby, for **Lord Oxeye of Wantley** 1070.

662 **Com.**—Major Best, Park House, Boxley, Maidstone, for **Chancellor.**

Class 64.—*Sussex Bulls, calved in* 1891. [5 entries, 1 absent.]

669 **I.** (£10.)—J. S. Hodgson, Lythe Hill Farm, Haslemere, for **Headley** (vol. vii.), born Jan. 22; *s.* Dog Daisy 1112, *d.* Young Emily 1st 3622 *by* Prince Alfred 555.

667 **II.** (£5.)—The Earl of Derby, Birley, Witley, Surrey, for **Gladiator** (vol. vii.), born Feb. 15; *s.* Jubilee 826, *d.* Gladsome 3rd 4008 *by* Oxford 2nd 771.

668 **R. N. & H. C.**—Joseph Godman, Park Hatch, Godalming, for **Lord Noble.**

666 **Com.**—Major Best, Park House, Boxley, Kent, for **Bacchus.**

Class 65.—*Sussex Cows or Heifers (in-milk or in-calf), calved before or in* 1889. [4 entries, none absent.]

672 **I.** (£15.)—The Earl of Derby, Birtley, Witley, Godalming, for **Brawny** 4685, born Mar. 6, 1889, calved Apr. 28, 1892, bred by W. Wood, junr., Hassocks; *s.* Fitzgerald 3rd 749, *d.* Briony 6th 3649 *by* Golding 597.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

673 II. (£10.[1])—W. S. FORSTER, Gore Court, Maidstone, for **Black Eyes** 4388, born Aug. 5, 1888, calved May 22, 1892; *s.* Goldsmith 391, *d.* Surprise 3116 *by* Archduke 381.

Class 66.—*Sussex Heifers, calved in* 1890. [6 entries, 1 absent.]

677 I. (£15.)—JOSEPH GODMAN, Park Hatch, Godalming, for **Comely 19th** 5070, born Jan. 10; *s.* Nobleman 707, *d.* Comely 9th 3682 *by* Goldboy 541.

678 II. (£10.)—JOSEPH GODMAN, for **Comely 21st**, born Feb. 26; *s.* Nobleman 3rd 906, *d.* Comely 10th 3684 *by* Goldboy 541.

680 R. N. & H. C.—C. T. LUCAS, Warnham Court, Horsham, for **Verity 3rd.**

676 H.C.—W. S. FORSTER, Gore Court, Maidstone, for **Fedora.**

Class 67.—*Sussex Heifers, calved in* 1891. [5 entries, none absent.]

684 I. (£10.)—W. S. FORSTER, Gore Court, Maidstone, for **Foxglove** (vol. vii.), born Jan. 20; *s.* Oxford Duke 840, *d.* Rosemary 4381 *by* Careful 741.

685 II. (£5.)—C. T. LUCAS, Warnham Court, Horsham, for **Breeze**, born Jan. 21; *s.* Lord John 934, *d.* Wind 4830 *by* Statesman.

681 R. N.—MAJOR BEST, Park House, Boxley, Maidstone, for **Sevastopol.**

Longhorns.[2]

Class 68.—*Longhorn Bulls, calved in* 1888, 1889, *or* 1890. [3 entries, none absent.]

686 I. (£10.)—J. T. OXLEY, Stowe Home Farm, Buckingham, for **Victor**, red & white, born June 15, 1889, bred by the late Duke of Buckingham and Chandos; *s.* Kenilworth, *d.* Vestris *by* Conqueror 5th.

687 R. N. & Com.—THOMAS SATCHWELL, Hernfield, Knowle, for **Punch.**

Class 69.—*Longhorn Cows or Heifers of any age (in-milk or in-calf).* [4 entries, 1 absent.]

689 I. (£10.)—J. T. OXLEY, Stowe Home Farm, Buckingham, for **Adelina 2nd**, red & white, born July 18, 1888, calved May 29, 1892, bred by the late Duke of Buckingham & Chandos; *s.* Kenilworth, *d.* Adelina *by* Captain Shaw.

690 R. N. & H. C.—J. T. OXLEY, for **Wallflower**, brindle & white.

691 Com.—T. SATCHWELL, Hernfield, Knowle, for **Emily.**

Welsh.

Class 70.—*Welsh Bulls, calved in* 1887, 1888, *or* 1889. [6 entries, 1 absent.]

693 I. (£10.)—LORD HARLECH, Glyn, Talsarnan, for **Master Tom**, born Jan. 4, 1889; *s.* Tichborne 160, *d.* Rosebud *by* Black Prince 4.

696 II. (£5.)—COL. HENRY PLATT, Gorddinog, Llanfairfechan, for **Cromwell** 194, born Apr. 12, 1887; *s.* Ap Gwilym 70, *d.* Cariad *by* Grand Duke 22.

694 R. N. & H. C.—JOHN JONES, Central Buildings, Llandudno, for **Y Flws Du.**

Class 71.—*Welsh Bulls, calved in* 1890 *or* 1891. [7 entries, none absent.]

702 I. (£10.)—JOHN JONES, Central Buildings, Llandudno, for **Sir Teirionydd**, born Mar. 4, 1890, bred by T. Jones, Cefntir, Mynach, Bala; *s.* Jack, *d.* Rhyd y fen.

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[1] This animal, originally Reserve Number, succeeded to second prize under regulation 54.
[2] Prizes given by the Warwick Local Committee.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

699 II. (£5.)—R. M. GREAVES, Wern, Tremadoc, for **Brenin Morfa** (vol. iv.), born Jan. 3, 1891; *s.* Ulundi 150, *d.* Morwyn Morfa *by* Ernion.

703 R. N. & Com.—WM. E. OAKELEY, The Plâs, Tan-y-Bwlch, for **Ardudwy**.

Class 72.—*Welsh Cows or Heifers (in-milk or in-calf), calved before or in* 1889. [6 entries, 1 absent.]

711 I. (£10.[1])—SIR HENRY WIGGIN, BT., Metchley Grange, Harborne, for **Martha** 362, born Jan. 20, 1885, calved Jan. 5, 1892, bred by Capt. L. H. Thomas, Caerffynon, Talsarnan; *s.* Zulu 138.

708 II. (£5.)—COL. HENRY PLATT, Gorddinog, Llanfairfechan, for **Blodwen 2nd** 751, born Mar. 4, 1889, calved Feb. 16, 1892; *s.* Bromfield 191, *d.* Blodwen 146 *by* Grand Duke 22.

Class 73.—*Welsh Heifers, calved in* 1890. [4 entries, none absent.]

715 I. (£10.)—COL. HENRY PLATT, Gorddinog, Llanfairfechan, for **Peris**, born about Mar., bred by T. Close, Llwynperis, Llanberis; *s.* Bob, *d.* Blacken *by* Cymro.

712 II. (£5.)—LORD HARLECH, Glyn, Talsarnan, born Feb. 2; *s.* Tichborne, *d.* Empress.

713 R. N.—LORD HARLECH, born July 5; *s.* Connaught, *d.* Nelly.

Class 74.—*Welsh Heifers, calved in* 1891. [5 entries, none absent.]

720 I. (£10.)—COL. HENRY PLATT, Gorddinog, Llanfairfechan, for **Caroline**, born Jan. 30, bred by H. Ellis, Tairmeibion, Bangor; *s.* Humphrey 152, *d.* Carvan *by* Pentir King 112.

718 II. (£5.)—LORD HARLECH, Glyn, Talsarnan, born Jan. 29; *s.* Connaught, *d.* Fairy Queen.

717 R. N. & Com.—LORD HARLECH, born Jan. 3; *s.* Tichborne, *d.* Gypsy.

Red Polled.

Class 75.—*Red Polled Bulls, calved in* 1887, 1888, *or* 1889. [4 entries, 1 absent.]

722 I. (£15 & Champion, £10 10*s.*[2])—LORD HASTINGS, Melton Constable, E. Dereham, for **Broadbent** 1721, born Apr. 27, 1889, bred by A. Taylor, Starston Place, Harleston; *s.* Bardolph 977, *d.* Bunch 3905 *by* Passion 714.

721 II. (£10.)—W. A. TYSSEN AMHERST, M.P., Didlington Hall, Brandon, for **Red Shirt** 2014, born May 28, 1889, bred by T. Fulcher, Elmham, E. Dereham; *s.* Frantic 1381, *d.* Violet 3rd 4427 *by* Lancer 689.

723 R. N.—MRS. PERKINS, Saham Hall, Watton, for **Mr. Pickwick** 1953.

Class 76.—*Red Polled Bulls, calved in* 1890. [4 entries, 1 absent.]

725 I. (£15.)—W. A. TYSSEN AMHERST, M.P., Didlington Hall, Brandon, for **Didlington Davyson 5th** 2263, born May 16; *s.* Monk 1573, *d.* Didlington Davy 2148 *by* Davyson 7th 476.

726 II. (£10.)—J. J. COLMAN, M.P., Carrow Ho., Norwich, for **Jupiter** 2380, born Jan. 20; *s.* Iago 1025, *d.* Midsummer Rose 2976 *by* Othello 713.

728 R. N. & H. C.—R. H. MASON, Necton Hall, Swaffham, for **Lord Robert** 2395.

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[1] As to the original awards in class 72, see page xci.
[2] Given by the Red Polled Society for the best Red Polled animal exhibited.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 77.—*Red Polled Bulls, calved in* 1891. [7 entries, 3 absent.]

730 **I.** (£10.)—J. J. COLMAN, M.P., Carrow Ho., Norwich, for **Red Prince** 2902, born Feb.; *s.* Laureate 1563, *d.* Prize 5077 *by* Cromwell 647.

729 **II.** (£5.)—J. J. COLMAN, M.P., for **Ruby King** 2925, born Feb. 26; *s.* Iago 1025, *d.* Doris 4532 *by* Falstaff 303.

731 **R. N. & H. C.**—H. P. GREEN, Caistor Hall, Norwich, for **Prince Charming.**

734 **Com.**—R. H. MASON, Necton Hall, Swaffham, for **The Kaiser.**

Class 78.—*Red Polled Cows or Heifers (in-milk or in-calf), calved before or in* 1889. [8 entries, 1 absent.]

739 **I.** (£15 & R. N. for Champion.[1])—H. P. GREEN, Caistor Hall, Norwich, for **Gleam 3rd** 4925, born Dec. 10, 1888, calved Mar. 31, 1892; *s.* Viking 959, *d.* Gleam 4564 *by* Roundhead 564.

737 **II.** (£10.)—W. A. TYSSEN AMHERST, M.P., Didlington Hall, Brandon, for **Saltarella** 5110, born July 23, 1888, calved July 31, 1891; *s.* Didlington Davyson 4th 1003, *d.* Satanella 3732 *by* Cortes 645.

741 **III.** (£5.)—A. G. LUCAS, Ashlyns, Berkhamsted, for **Donna Anna** 5410, born Jan. 5, 1889, calved Mar. 10, 1892; *s.* Don Carlos 659, *d.* Annie 1985 *by* Bounty 460.

738 **R. N. & H. C.**—J. J. COLMAN, M.P., Carrow Ho., Norwich, for **Buttercup.**
Com.—W. A. TYSSEN AMHERST, M.P., for No. 736, **Emerald**; LORD HASTINGS for No. 740, **Davy 85th**; MRS. PERKINS for No. 742, **Ivy 3rd.**

Class 79.—*Red Polled Heifers, calved in* 1890. [10 entries, 2 absent.]

746 **I.** (£15.)—J. J. COLMAN, M.P., Carrow House, Norwich, for **Dorena** 6308, born Feb. 26; *s.* Iago 1025, *d.* Doris 4532 *by* Falstaff 303.

752 **II.** (£10.)—LORD HASTINGS, Melton Constable, E. Dereham, for **Davy 102nd**, born May 28, bred by J. Hammond, Bale, E. Dereham; *s.* Broadhead 802, *d.* Davy 58th 2745 *by* Davyson 16th 653.

750 **III.** (£5.)—THE DUKE OF HAMILTON AND BRANDON, K.T., Easton Park, Wickham Market, for **Ringlet**, born June 20; *s.* Blandford 958, *d.* Crocus 2729 *by* Suffolk Baronet 583.

745 **R. N. & H. C.**—W. A. TYSSEN AMHERST, M.P., for **Saltarella 3rd** 6730.
Com.—W. A. TYSSEN AMHERST, M.P., for No. 744, **Popsey**; J. J. COLMAN, M.P., for No. 747, **Silent Ada**; H. P. GREEN for No. 749, **Ultrada 2nd**; A. G. LUCAS for No. 753, **Ashlyns Eveline.**

Class 80.—*Red Polled Heifers, calved in* 1891. [4 entries, 1 absent.]

755 **I.** (£10.)—J. J. COLMAN, M.P., Carrow Ho., Norwich, for **Rose Alba** 7468, born Jan. 19; Laureate 1563, *d.* Midsummer Rose 2976 *by* Othello 713.

757 **II.** (£5.)—A. G. LUCAS, Ashlyns, Berkhamsted, for **Ashlyns Pink 2nd**, born Mar. 15; *s.* Don Carlos 659, *d.* Ashlyns Pink 3242 *by* Nobby 706.

754 **R. N.**—J. J. COLMAN, M.P., for **Banksea Rose** 6960, born Mar. 24.

Jerseys.

Class 81.—*Jersey Bulls, calved in* 1888, 1889, *or* 1890. [25 entries, 4 absent.]

763 **I.** (£15.)—JAMES BLYTH, Wood House, Stansted, for **Distinction's Pride** 14 86 I.H.B., H.C., grey fawn, born Feb. 25, 1890, bred by F. J. Noel, St. Martin's, Jersey; *s.* Hillside Lad 3369, *d.* Distinction 5519, I.H.B.

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[1] Given by the Red Polled Society for the best Red Polled animal exhibited.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

772 II. (£10.)—THE EARL OF LONDESBOROUGH, Londesborough Park, Yorks, for **Grouville's Dairyman** (vol. v. p. 280), bronze fawn, born May 15, 1890, bred by H. A Blyth, Stansted; *s.* Grouville's champion 3346, *d.* Dairymaid 2nd *by* Rocket 1969.

765 III. (£5.)—JAMES BLYT , for **Silver Sea** 1475 I.H.B., P.S.H.C., grey, born Mar. 13, 1890, bred by F. J. Hubert, St. Owens, Jersey; *s.* Mourier King 3556 E.J.H.B., *d.* Duchess of St. Owens 3085 I.H.B., P.S.H.C.

770 R. N. & H. C.—GILBERT GREENALL, Walton Hall, Lancs., for **Zulu's Pride.**

H. C.—SIR R. GRAHAM, BT., for No. 769, **Norton Nero**; LORD ROTHSCHILD for No. 778, **President Carnot**; G. E. SMART for No. 781, **Jupiter.**

Com.—JAMES BLYTH for No. 764, **Rosy's Process**; A. E. MCMULLEN for No. 773, **Maufant Lad**; LORD ROTHSCHILD for No. 777, **President**, and No. 779, **Albany**; GEORGE SIMPSON for No. 780, **Bessie's Monopolist.**

Class 82.—*Jersey Bulls, calved in* 1891. [31 entries, 4 absent.]

811 I. (£10.)—LORD ROTHSCHILD, Tring Park, for **Spots Lad**, bronze fawn, born Apr. 9; *s.* Columbus 3184, *d.* Spot 7437 I.H.B. *by* Sir Garnet 405.

792 II. (£5.)—H. J. CORNISH, Thornford, Sherborne, for **Bismarck** I.H.B. 1669 H.C., brown, born Jan. 15, bred by F. O. D'Auvergne, St. Owen's, Jersey; *s.* May Lad 1240 I.H.B., *d.* Wyandotte 7393 I.H.B.

809 R. N. & H. C.—LORD ROTHSCHILD, for **Flora's Lad**, fawn, born Apr. 26.

H. C.—W. BARRON for No. 785, **Lord of the Isles**; JAMES BLYTH for No. 787, **Grouville's Phil**; J. R. CORBETT for No. 791, **Harry**; H. J. CORNISH for No. 793, **Kitty's Prince.**

Com.—JAMES BLYTH for No. 786, **Goldfinder**, and for No. 788, **Mabel Duke**; CAPT. THE HON. T. S. BRAND, R.N., for No. 789, **Spartan K.1.**; GEORGE SIMPSON for No. 812, **Milkman.**

Class 83.—*Jersey Cows (in-milk), calved before or in* 1888. [30 entries, 5 absent.]

840 I. (£15.)—LORD ROTHSCHILD, Tring Park, for **Pontorson** 1875 I.H.B., grey, born Apr. 12, 1885, calved Apr. 12, 1892, bred by J. Gallois, St. Clement's, Jersey; *s.* Happy Cetewayo 2499, *d.* Congo *by* Le Boulevard.

837 II. (£10.)—R. J. POPE, Beresford Manor, Plumpton, for **Carillon** (vol. v. p. 240 E.J.H.B.), whole colour, born Aug. 16, 1885, calved May 31, 1892, bred by J. A. Gibaut, Jersey; *s.* Egeon 1550, *d.* Concorde 2772 *by* Brown Prince 130.

842 III. (£5.)—GEORGE SIMPSON, Wray Park, Reigate, for **Rosy 3rd** (vol. v. p. 644), yellow fawn, born Jan. 26, 1884, calved May 6, 1892, bred by Wm. Alexander, jun., St. Mary's, Jersey; *s.* Wolseley 2165, *d.* Rosy 512 I.H.B., P.S. *by* Carlo 180 I.H.B., P.S.

828 R. N. & H. C.—THE HON. MRS. CECIL HOWARD, for **Rather Pretty 2nd.**

H. C.—WM. ARKWRIGHT for No. 815, **Scarsdale Liberty**; S. BAXENDALE for No. 817, **Wolseley's Janette**; JAMES BLYTH for No. 818, **Gloire d'Or**; H. J. CORNISH for No. 824, **Star 2nd**; GILBERT GREENALL for No. 826, **La Chasse's Fancy 3rd**; THE EARL OF LONDESBOROUGH for No. 829, **Marchioness**; G. W. PALMER for No. 836, **Fancy's Pride**; LORD ROTHSCHILD for No. 839, **Clemence 2nd**, and for No. 841, **Spot.**

Com.—WM. ALEXANDER, JUN., for No. 814, **Estimate 3rd**; JAMES BLYTH for No. 819, **Lady Safety**; J. BRUTTON for No. 821, **Bay Leaf 4th**; THE EARL OF LONDESBOROUGH for No. 830, **Précoce II.**

Class 84.—*Jersey Cows (in-milk), calved in* 1889. [18 entries, 4 absent.]

856 I. (£15.)—GILBERT GREENALL, Walton Hall, Warrington, for **Miranda**, brown, born Feb. 1, calved May 11, 1892, bred by F. Le Brocq, St. Peter's, Jersey; *s.* Lord Nelson 900 I.H.B., *d.* Slipper 2862 I.H.B.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

845 **II.** (£10.)—WM. ARKWRIGHT, Sutton Scarsdale, Chesterfield, for **Scarsdale Bistre**, whole fawn, born Feb. 27, calved Apr. 14, 1892, bred by F. Rouland, St. Helier's, Jersey; *s.* Count Bismarck 923 I.H.B., *d.* Rosie of Belmont 2290 *by* Everton King 390 I.H.B.

851 **III.** (£5.)—H. J. CORNISH, Thornford, Sherborne, for **Deodora**, grey, born June 7, calved May 11, 1892, bred by S. De La Haye, St. Helier's, Jersey s. Marcus 3510, *d.* Lady Derby 2nd *by* Boniface 2271.

861 **R. N. & H. C.**—A. M. TREE, Ashorne Hill, Leamington, for **Wallplate 2nd.**

H. C.—WM. ALEXANDER, JUN., for No. 844, **Templar's Lass 5th**; JAMES BLYTH for No. 847, **Lady May 2nd**; LORD ROTHSCHILD for No. 858, **Miss Rosy.**

Com.—FOWLER & DE LA PERRELLE, for No. 853, **Beurrière**, and for No. 854, **Franche Dome 2nd**; GEORGE SIMPSON for No. 859, **Pandora 15th**; A. M. TREE for No. 860, **Lizette.**

Class 85.—*Jersey Heifers* (*in-milk or in-calf*). *calved in* 1890. [38 entries, 7 absent.]

882 **I.** (£15.)—GILBERT GREENALL, Walton Hall, Warrington, for **Daisy of the Valley**, brown, born Feb. 19, calved May 17,1892, bred by J. C. Le Sueur, St. Saviour's, Jersey; *s.* Count Wolseley 928 I.H B., *d.* Beauty of Ogden 3563 I.H.B.

893 **II.** (£10.)—LORD H. F. H. PELHAM-CLINTON-HOPE, The Deepdene, Dorking, for **Christmas Carol** (vol. v. p. 368 E.J.H.B.), whole fawn, born Feb. 14, calved Mar. 14, 1892, bred by Mrs. Brooke Smith, Stoke Bishop, Bristol; *s.* Frivol 2454, *d.* Gloaming *by* Phœbus 1881.

889 **III.** (£5.)—THE EARL OF LONDESBOROUGH, Londesborough Park, for **Happy Girl** (vol. v. p. 141 E.J.H.B.), fawn, born Jan. 5, calved May 21, 1892; *s.* Marius 2650, *d.* Abigail *by* Rainbow 1943.

875 **R. N. & H. C.**—H. J. CORNISH, Thornford, Sherborne, Dorset, for **Cassia.**

H. C.—WM. ALEXANDER, JUN., for No. 862, **L'étocquet Princess**, and for No. 864, **Venetia**; WM. ARKWRIGHT for No. 865, **Scarsdale Florida**; J. BRUTTON for No. 869, **Mountain Rose**; J. R. CORBETT for No. 874, **Stargazer C.**; GILBERT GREENALL for No. 884, **Princesse Du Couvent**; MRS. STARKIE for No. 898, **Grouville's Fancy.**

Com.—J. R. CORBETT for No. 873, **Mabel 9th**; FOWLER & DE LA PERRELLE for No. 880, **Coquette 2nd**, and for No. 881, **Grey Jessamine**; A. E. MCMULLEN for No. 891, **Perry Farm Eminence**; LORD ROTHSCHILD for No. 894, **Belle.**

Class 86.—*Jersey Heifers, calved in* 1891. [36 entries, 7 absent.]

902 **I.** (£10.[1])—SALISBURY BAXENDALE, Bonningtons, Ware, for **Tamarisk**, whole colour, born Aug. 24; *s.* Nelson 3564, *d.* Trousseau *by* Baron Wolseley 2229.

903 **II.** (£5.)—JAMES BLYTH, Wood House, Stansted, for **Alpha**, grey, born Aug. 18; *s.* Runner 3763, *d.* Castor's Alphea *by* Castor 3154.

H. C.—J. R. CORBETT for No. 908, **Lilian 2nd**; THE COUNTESS OF LONSDALE for No. 917, **Snowflake of Lowther**; LORD ROTHSCHILD for No. 929, **Cupida**; ST. JOHN'S COLLEGE, CAMBRIDGE, for No. 933, **Mirabel.**

Com.—W. BARRON for No. 901, **Golden Princess**; THE EARL OF LONDESBOROUGH for No. 915, **Bacchante**; A. E. MCMULLEN for No. 919, **Rose's Beauty**; THE MAISONETTE DAIRY CO. for No. 921, **Rose**; R. J. POPE for No. 927, **Turtle's Princess 2nd**; LORD ROTHSCHILD for No. 930, **Lady of the Lake.**

[1] As to the disqualification of the animal to which the first prize in class 86 was originally awarded, see page xci.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Guernseys.

Class 87.—*Guernsey Bulls, calved in* 1888, 1889 *or* 1890. [7 entries, 2 absent.]

940 I. (£15.)—Col. H. W. Shakerley, Fairlight, Hastings, for **Paradox** 352 E.G.H.B., pale fawn & white, born Feb. 21, 1888, bred by P. Martel, Castel, Guernsey; *s.* Marc Antony 386 R.G.A.S., P.S., *d.* May Rose 2nd.

942 II. (£10.)—Sir H. A. J. D. Tichborne, Bt., Tichborne Park, Hants, for **Fearless** 466, E.G.H.B., fawn, born, Apr. 16, 1890, bred by J. Dumont, St. Martin's, Guernsey; *s.* Archibald 442, R.G.A.S., P.S., *d.* Clarissa 1655, R.G.A.S.

939 III. (£5.)—Sir F. A. Montefiore, Bt., Worth Park, Crawley, for **Sir Francis 2nd**, orange & white, born Aug. 31, 1890; *s.* Loftus 248, *d.* Laura 3rd 1094.

941 R. N. & H. C.—Julian Stephens, Grove House, Finchley, for **May Boy**.

Class 88.—*Guernsey Bulls, calved in* 1891. [8 entries, none absent.]

950 I. (£10.)—H. C. Stephens, M.P., Avenue House, Finchley, for **Finchley Beau** 467 E.G.H.B., red & white, born Aug. 24; *s.* May Boy 346 E.G.H.B., *d.* Jeannette 579 E.G.H.B. *by* Climax 14 E.G.H.B.

943 II. (£5.)—The Express Dairy Company Limited, Finchley, for **Queen's Champion** 506 E.G.H.B., orange, fawn & white, born Sept. 2; *s.* Royal Champion 435, *d.* Queen of Beauty 3rd *by* Excelsior 8th 138.

945 R. N. & H. C.—G. Long, Ogbourne St. Andrew, Marlborough, for **Oriole.**
H. C.—Fowler & De la Perrelle for No. 944, **Maximus of the Poidevins**; Sir F. A. Montefiore, Bt., for No. 947, **Lord Worth 2nd.**
Com.—Lord Montagu for No. 946, **Chief Baron.**

Class 89.—*Guernsey Cows or Heifers (in-milk), calved before or in* 1889. [11 entries, 1 absent.]

958 I. (£15.)—Sir F. A. Montefiore, Bt., Worth Park, Crawley, for **Marguerite des Fauxcennaires** 1382, fawn & white, born Aug. 2, 1887, calved May 31, 1892, bred by T. Martin, Guernsey; *s.* Billy, *d.* Marguerite de Fauxcennaires 1996.

960 II. (£10.)—Julian Stephens, Grove House, Finchley, for **Alba** 1780 E.G.H.B., red & white, born May 3, 1886, bred by A. Chick, Castel, Guernsey; *s.* Volage 98 R.G.A.S., *d.* Sally 135 R.G.A.S.

957 III. (£5.)—Sir F. A. Montefiore, Bt., Worth Park, Crawley, for **Fortuna** 758 E.G.H.B., fawn & white, born Apr. 18, 1886, calved Apr. 3, 1892, bred by A. Rintoul, jun., Junior Carlton Club; *s.* Hopeful 25 E.G.H.B., *d.* Blossom 21.

952 R. N. & H. C.—The Express Dairy Co., Ltd., for **Golden Treasure 3rd.**
955 H. C.—Geo. Long for **Clara.** 956 Com.—Lord Montagu for **Lily du Preel 3rd.**

Class 90.—*Guernsey Heifers, calved in* 1890. [11 entries, none absent.]

968 I. (£15.)—Fowler & De la Perrelle, Southampton, for **Linda of the Poidevins** R.G.H.B. 2615, pale red, born May 15, bred by J. Le Martel, Guernsey; *s.* Archibald 442 R.G.A.S., *d.* Rosalie 3rd 791 R.G.A.S.

970 II. (£10.)—Sir F. A. Montefiore, Bt., Worth Park, Crawley, for **Queen of the Isles 3rd** 1699, fawn & white, born Apr. 17; *s.* Loftus, *d.* Queen of the Isles 663.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

969 III. (£5.)—GEO. LONG, Ogbourne St. Andrew, Marlborough, for **Nora 7th** 1685 E.G.H.B., fawn & white, born Apr. 4; *s.* Original 262 E.G.H.B., *d.* Nora 2nd 437 E.G.H.B., *by* Dr. Bill 161 R.G.A.S.

967 **R. N. & H. C.**—FOWLER & DE LA PERRELLE, Southampton, for **Fashion 2nd** R.G.H.B.

H.C.—THE EXPRESS DAIRY CO., LTD., for No. 962, **Golden Treasure 4th**; P. H. FOWLER for No. 965, **Lily des Godards 2nd**; COL. H. W. SHAKERLEY for No. 971, **Lady Evergreen**; H. C. STEPHENS, M.P., for No. 972, **Citron Blossom 4th.** **Com.**—P. H. FOWLER for No. 964, **Athlone 3rd.**

Class 91.—*Guernsey Heifers, calved in* 1891. [8 entries, none absent.]

977 I. (£10.)—SIR F. A. MONTEFIORE, BT., Worth Park, Crawley, for **Queen of the Isles 4th 2017**, fawn, born Mar. 18; *s.* Loftus 248, *d.* Queen of the Isles 663.

975 II. (£5.)—GEO. LONG, Ogbourne St. Andrew, Marlborough, for **Evelyn** 1836 E.G.H.B., red & white, born Oct. 5; *s.* Ashplant 272 R.G.A.S. *d.* Villageoise 2nd 838 P.S. *by* Royaliste 184 R.G.A.S.

976 **R. N. & H. C.**—GEO. LONG, for **Miss Ethel 3rd** 1980 E.G.H.B.

H. C.—THE EXPRESS DAIRY CO., LTD., for No. 973, **Lily of Finchley 2nd**; COL. H. W. SHAKERLEY for No. 979, **Phebe.**

Com.—FOWLER & DE LA PERRELLE for No. 974, **Lively.**

Kerries.

Class 92.—*Kerry Bulls, calved in* 1889, 1890 *or* 1891. [11 entries, none absent.]

988 I. (£10.)—MARTIN J. SUTTON, Kidmore Grange, Caversham, Reading, for **Kidmore Colorado 2nd**, born Apr. 26, 1891; *s.* Colorado 63, *d.* Flora 13.

985 II. (£5.)—THE MARQUESS OF LANSDOWNE, Bowood, Calne, for **Shanboe**, born Mar. 23, 1890, bred by Viscount de Vesci, Abbeyleix, Queen's Co.; *s.* Feale 8, *d.* Princess Mary.

986 **R. N. & H. C.**—THE DUCHESS OF NEWCASTLE, Clumber, for **Black Prince.**

981 **H. C.**—C. R. W. ADEANE, Babraham Hall, Cambridge, for **Blackamoor.**

Com.—A. DEVERELL for No. 983, **Zurich**; THE MARQUESS OF LANSDOWNE for No. 984, **Euda's Glory.**

Class 93.—*Kerry Cows or Heifers, of any age (in-milk or in-calf).* [13 entries, 1 absent.]

1004 I. (£10.)—MARTIN J. SUTTON, Kidmore Grange, Caversham, Reading, for **Peep** 732, age unknown, calved Jan. 13, 1892, breeder unknown.

995 II. (£5.)—THE EXPRESS DAIRY CO., LTD., Finchley, for **Lady Clara**, born Apr. 1886, calved Apr. 1, 1892, breeder unknown.

993 **R. N. & H. C.**—ALFRED DEVERELL, for **Killarney** 1091.

H. C.—G. F. ROUMIEU, for No. 1001, **Aster**; MARTIN J. SUTTON, for No. 1003, **Nigella.**

Dexter Kerries.

Class 94.—*Dexter Kerry Bulls, calved in* 1889, 1890 *or* 1891. [14 entries, 2 absent.]

1013 I. (£10.)—MARTIN J. SUTTON, Kidmore Grange, Caversham, Reading, for **Kidmore Paradox**, born Jan. 6, 1890; *s.* Paradox 18, *d.* Silene 189.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

1015 **II.** (£5.)—MARTIN J. SUTTON, for **Red Prince**, red, born July 15, 1890; *s.* Paradox 18, *d.* Dewberry 69.

1014 **R. N. & H. C.**—MARTIN J. SUTTON, for **Kidmore Paradox 2nd.**
H. C.—JAMES ROBERTSON for No. 1008, **Conqueror**; HAROLD SWITHINBANK for No. 1016, **Denham Fergus.**

Class 95.—*Dexter Kerry Cows or Heifers of any age (in-milk or in-calf).* [18 entries, 5 absent.]

1034 **I.** (£10.)—MARTIN J. SUTTON, Kidmore Grange, Caversham, Reading, for **Red Rose** 178, red, born 1886, calved Mar. 31, 1892, breeder unknown.

1036 **II.** (£5.)—HAROLD SWITHINBANK, Denham Court, Bucks, for **Denham Lady Lisburn** 60, red, born about 1885, breeder unknown.

1035 **R. N. & H. C.**—HAROLD SWITHINBANK, for **Denham Lady Limerick** 59.
H. C.—JAMES ROBERTSON for No. 1028, **Lobelia**; MARTIN J. SUTTON for No. 1032, **Lady Lisburn,** and for No. 1033, **Mignonette 2nd.**
Com.—H. D. D. BETTERIDGE for No. 1023, **Nelly**; G. F. ROUMIEU for No. 1031, **Zinnia.**

DAIRY CATTLE.

Class 96.—*Dairy Cows, in-milk, of any breed or cross, giving the greatest quantity of milk containing (on the average of two milkings) not less than* 12 *per cent. Solids, and* 3 *per cent. Butter Fat, and which have calved not less than three months before the date of the Show.* [4 entries, none absent.]

1037 **I.** (£10.)—SALISBURY BAXENDALE, Henham Lodge, Bishop's Stortford, for **Buttercup** (Shorthorn), roan, born about 1884, calved Feb. 4, 1892, breeder unknown.

1038 **II.** (£7.)—SALISBURY BAXENDALE, for **Rose** (Shorthorn), red, born about 1887, in-milk, calved Mar. 8, 1892, breeder unknown.

1040 **III.** (£5.)—GEORGE CHURCH, Willington, Bedford, for **Number One** (Shorthorn), red & white, born about 1885, calved Dec. 29, 1891.

Class 97.—*Dairy Cows, in-milk, of any breed or cross, giving the greatest quantity of milk containing (on the average of two milkings) not less than* 12 *per cent. Solids, and* 3 *per cent. Butter Fat, irrespective of the date of Calving.* [12 entries, 1 absent.]

Class 97a.—*Cows, of* 1100 *lb. or over, live weight.*

1052 **I.** (£10.)—C. A. PRATT, Rushford, Evesham, for **Dowager** (Shorthorn), roan, born Feb. 1887, calved May 2, 1892.

1042 **II.** (£7.)—SALISBURY BAXENDALE, Henham Lodge, Bishop's Stortford, for **Ethel** (Shorthorn), red, born about 1887, breeder unknown.

1050 **III.** (£5.)—GEORGE CHURCH, Willington, Bedford, for **Nancy** (Shorthorn), red, born about 1887, calved Mar. 22, 1892.

Class 97b.—*Cows, under* 1100 *lb., live weight.*

1041 **I.** (£10.)—C. R. W. ADEANE, Babraham Hall, Cambridge, for **Babraham Belle** 133 (Kerry), born about 1887, breeder unknown.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

1049 II. (£7.)—GEORGE CHURCH, Willington, Bedford, for **Flower** (Red Polled), born about 1887, calved Apr. 8, 1892, breeder unknown.

1048 III. (£5.)—GEORGE CHURCH, for **Fancy** (Shorthorn & Red Polled cross), blue roan, born July 28, 1888, calved Mar. 30, 1892.

SHEEP.

Leicesters.

Class 98.—*Leicester Two-Shear Rams.* [8 entries, 2 absent.]

1057 **I.** (£10.)—T. H. HUTCHINSON, Catterick, Yorks, born Mar. 1890.
1056 **II.** (£5.)—R. & G. HARRISON, Underpark, Yorks, born Mar. 1890.
1059 **R. N. & H. C.**—E. F. JORDAN, Eastburn, Driffield, born Apr. 1890.

Class 99.—*Leicester Shearling Rams.* [13 entries, 4 absent.]

1069 **I.** (£15.) & 1071 **II.** (£10.)—E. F. JORDAN, Eastburn, Driffield, born Mar.
1065 **III.** (£5.)—R. & G. HARRISON, Underpark, Yorks, born Mar. 1891.
1067 **R. N.**—T. H. HUTCHINSON, Catterick, Yorks, born Mar. 1891.

Class 100.—*Pen of Three Leicester Ram Lambs, dropped in* 1892. [7 entries, 3 absent.]

1074 **I.** (£10.)—R. & G. HARRISON, Underpark, Lealholm, Yorks, born Mar.
1078 **II.** (£5.)—MASKELL & STRICKLAND, Brandsby, Easingwold, born Mar.
1075 **R. N.**—E. F. JORDAN, Eastburn, Driffield, born Mar. 1892.

Class 101.—*Pen of Three Leicester Shearling Ewes, of the same flock.* [6 entries, none absent.]

1082 **I.** (£15.)—R. & G. HARRISON, Underpark, Yorks, born Mar. 1891.
1084 **II.** (£10.)—E. F. JORDAN, Eastburn, Driffield, born Mar. 1891.
1081 **III.** (£5.)—R. & G. HARRISON, Underpark, Yorks, born Mar. 1891.
1083 **R. N.**—E. F. JORDAN, Eastburn, Driffield, born Mar. 1891.

Cotswolds.

Class 102.—*Cotswold Two-Shear Rams.* [3 entries, 1 absent.]

1088 **I.** (£10.)—R. GARNE, Aldsworth, Northleach, for **Royal Doncaster**, born Feb. 1890; *s.* B. D., *d. by* Experiment.

1089 **R. N. & H. C.**—R. GARNE, born Feb., 1890.

Class 103.—*Cotswold Shearling Rams.* [9 entries, none absent.]

1093 **I.** (£15.)—R. GARNE, Aldsworth, Northleach, born Jan. 1891.
1091 **II.** (£10.)—G. BAGNALL & SON, Westwell, born Jan. 24, 1891.
1096 **III.** (£5.)—RUSSELL SWANWICK, R. A. C. Farm, Cirencester, born about Feb. 14, 1891.

1098 **R. N. & Com.**—RUSSELL SWANWICK, born about Feb. 14, 1891.

Class 104.—*Pen of Three Cotswold Ram Lambs, dropped in* 1892. [8 entries, 2 absent.]

1100 **I.** (£10.)—R. GARNE, Aldsworth, Northleach, born Jan. 1892.
1103 **II.** (£5.)—C. GILLETT, Lower Haddon, Faringdon, born about Jan. 10.
1102 **R. N. & H. C.**—C. GILLETT, born about Jan. 10, 1892.
1101 **H. C.**—R. GARNE. **Com.**—T. R. HULBERT, for No. 1104; RUSSELL SWANWICK for No. 1105.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 105.—*Pen of Three Cotswold Shearling Ewes, of the same flock.* [8 entries, 2 absent.]

1108 I. (£15.)—G. BAGNALL & SON, Westwell, Burford, born Jan. 1891.
1107 II. (£10.)—G. BAGNALL & SON, born Feb. 1891.
1112 III. (£5.)—RUSSELL SWANWICK, R. A. C. Farm, Cirencester, born about Feb. 14, 1891.

1109 R. N. & H. C.—G. BAGNALL & SON, born Feb. 1891.
Com.—T. R. HULBERT for No. 1110; RUSSELL SWANWICK for No. 1113.

Lincolns.

Class 106.—*Lincoln Two-Shear Rams.* [5 entries, 2 absent.]

1119 I. (£10.)—ROBERT WRIGHT, Nocton Heath, Lincoln, for **Royal Doncaster** 385, born Feb. or Mar. 1890; *s.* Melton 254.

1118 II. (£5.)—ROBERT WRIGHT, for **Clear the Way** 93, born Feb. or Mar. 1890, bred by W. H. Morton, Brauh, Broughton, Lincoln.

1116 R. N.—H. SHARPLEY, Limber Magna, Ulceby, for **Limber A**, born Mar.

Class 107.—*Lincoln Shearling Rams.* [16 entries, 1 absent.]

1123 I. (£15) & 1122 II. (£10.)—HENRY DUDDING, Riby Grove, Gt. Grimsby, born about Feb. 20, 1891.

1135 III. (£5.)—ROBERT WRIGHT, Nocton Heath, Lincoln, born Feb. or Mar. 1891.

1130 R. N. & H. C.—JOHN PEARS, Mere, Lincoln, born about Feb. 20, 1891.
H. C.—WM. HESSELTINE for No. 1125; ROBERT WRIGHT for No. 1134.
Com.—HENRY DUDDING for No. 1124.

Class 108.—*Pen of Three Lincoln Ram Lambs, dropped in* 1892. [9 entries, 1 absent.]

1140 I. (£10.)—JOHN PEARS, Mere, Lincoln, born about Feb. 20, 1892.
1143 II. (£5.)—ROBERT WRIGHT, Nocton Heath, Lincoln, born Feb. or Mar.
1137 R. N. & H. C.—HENRY DUDDING, Riby Grove, Great Grimsby.
1141 H. C.—JOHN WESTROPE. 1138 Com.—HENRY DUDDING.

Class 109.—*Pen of Three Lincoln Shearling Ewes, of the same flock.* [7 entries, none absent.]

1146 I. (£15.)—H. DUDDING, Riby Grove, Gt. Grimsby, born about Feb. 20, '91.
1150 II. (£10) & 1151 III. (£5.)—R. WRIGHT, Nocton Heath, Lincoln, born Feb. or Mar. 1891.

1147 R. N. & H. C.—H. DUDDING, Riby Grove, Gt. Grimsby, born about Feb. 20, '91.
1148 H. C.—WM. HESSELTINE. Com.—J. W. DAINTY for No. 1145; JOHN PEARS for No. 1149.

Oxford Downs.

Class 110.—*Oxford Down Two-Shear Rams.* [5 entries, none absent.]

1152 I. (£10 & **Champion** £10.[1])—J. C. EADY, Irchester Grange, Wellingborough, for **Lord Burton**, born Feb. 10, 1890; *s.* Excelsior 285, *d. by* Comet 243.

[1] Given by the Warwick Local Committee for the best Oxford Down Ram in Classes 110 and 111.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

1155 **II.** (*£5.*)—C. HOBBS & SON, Maisey Hampton, Glos., for **Unionist**, born Feb. 17, 1890; *s.* Triplet 521, *d. by* Treadwell's No. 4, 508.

1156 **R. N.**—GEORGE STREET, Maulden, Ampthill, for **Maulden Prince Royal**, born Feb. 1890; *s.* Druce's Rejected 521.

Class 111.—*Oxford Down Shearling Rams.* [26 entries, 3 absent.]

1162 **I.** (**£15 & R. N. for Champion.**[1])—ALBERT BRASSEY, Heythrop Park, Chipping Norton, born Jan. 14, 1891; *s.* Nobby Camperdown 709.

1161 **II.** (**£10.**)—ALBERT BRASSEY, born Jan. 15, 1891; *s.* Sir Milton 470.
1160 **III.** (**£5.**)—ALBERT BRASSEY, born Jan 9, 1891; *s.* Aylesbury 2nd 174.
1172 **R. N. & H. C.**—CHARLES HOWARD, Biddenham, Bedford, born Jan. 1891.
1171 **H. C.**—CHARLES HOWARD, born Jan. 1891; *s.* Biddenham No. 3, 825.
Com.—C. HOBBS & SON, for No. 1170; Z. W. STILGOE'S EXORS., for Nos. 1174, 1175, & 1176.

Class 112.—*Pen of Three Oxford Down Ram Lambs, dropped in* 1892. [14 entries, 5 absent.]

1188 **I.** (£10) & 1187 **II.** (£5.)—ALBERT BRASSEY, Heythrop Park, Chipping Norton, born Jan., 1892.

1183 **R. N. & H. C.**—G. ADAMS, Pidnell, Faringdon, born about Jan. 15, 1892.
1191 **H. C.**—R. W. Hobbs, Kelmscott, Lechlade, born about Jan. 27, 1892.

Class 113.—*Pen of Three Oxford Down Shearling Ewes, of the same flock.* [10 entries, 2 absent.]

1202 **I.** (**£15.**)—J. C. EADY, Irchester Grange, Wellingborough, born about Feb. 10, 1891; *s.* Testerton Royalty 966, *d. by* Vicar 523.

1199 **II.** (**£10.**)—A. BRASSEY, Heythrop Park, Chipping Norton, born Jan. 1891,
1197 **III.** (**£5.**)—G. ADAMS, Pidnell, Faringdon, born about Jan. 15, 1891.
1206 **R. N. & H. C.**—F. STREET, Somersham Park, St. Ives, Hunts.
Com.—GEO. ADAMS for No. 1198; J. T. GREEN for No. 1204.

Shropshires.

Class 114.—*Shropshire Two-Shear Rams.* [42 entries, 7 absent.]

1230 **I.** (**£10, R. N. for Champion**[2] **& Gold Medal.**[3])—A. E. MANSELL, Harrington Hall, Shifnal, born Mar. 1890.

1231 **II.** (**£5.**)—A. E. MANSELL, born Mar. 1890, bred by D. Bromilow. Bitteswell Hall, Lutterworth; *s.* Premier Duke 5440, *d. by* Bonny Face.

1223 **R. N. & H. C.**—W. F. INGE, Thorpe Hall, Tamworth, for **Thorpe Royal.**
H. C.—A. S. BERRY for No. 1208; T. & S. BRADBURNE for No. 1212, **Lord Kington**; GEO. GRAHAM for No. 1219; JOHN HARDING for No. 1220; T. S. MINTON for No. 1234; H. TOWNSHEND for No. 1246; M. WILLIAMS for No. 1248.
Com.—J. BOWEN-JONES for No. 1209; T. & S. BRADBURNE for No. 1213, **The Mint**; R. P. COOPER for No. 1215, **Longdon**; T. FENN for No. 1216; GEO. GRAHAM for No. 1218; WM. KIRKHAM for No. 1225; T. MEARES for No. 1233, **Red Gauntlett**; JOHN PRICE for No. 1237, **Appleby Champion II.**; R. THOMAS for No. 1244.

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[1] Given by the Warwick Local Committee for best Oxford Down Ram in Classes 110 and 111.
[2] Given by the Warwick Local Committee for best Shropshire Ram in Classes 114 and 115.
[3] Given by the Shropshire Sheep Breeders' Association for best Shropshire Ram in Classes 114 and 115.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 115.—*Shropshire Shearling Rams.* [106 entries, 12 absent.]

1288 **I.** (**£15, Champion £15,**[1] **& Gold Medal.**[2])—W. F. INGE, Thorpe Hall, Tamworth, born about Feb. 20, 1891.

1282 **II.** (**£10.**)—GEO. GRAHAM, The Oaklands, Birmingham, born about Mar. 6, 1891.

1251 **III.** (**£5.**)—MRS. MARIA BARRS, Odstone Hall, Atherstone, born Mar.
1254 **R. N. & H. C.**—A. S. BERRY, Gt. Barr, Birmingham, born Mar. 1891.

H. C.—MRS. MARIA BARRS for Nos. 1252 & 1253; A. S. BERRY for No. 1255; T. F. CHEATLE for No. 1270; GEO. GRAHAM for No. 1283; JOHN HARDING for No. 1285; W. F. INGE for Nos. 1289 & 1290; G. LEWIS for No. 1296; A. E. MANSELL for Nos. 1297 & 1298; P. A. MUNTZ, M.P., for Nos. 1314 & 1315; R. THOMAS for No. 1339; G. THOMPSON for No. 1345; M. WILLIAMS for No. 1351.

Com.—A. S. BERRY for No. 1256; J. BOWEN-JONES for No. 1257; H. BRADBURNE for No. 1263; T. & S. BRADBURNE for No. 1265; R. P. COOPER for No. 1276; T. FENN for No. 1280; GEO. GRAHAM for No. 1284; JOHN HARDING for Nos. 1286 & 1287; G. LEWIS for Nos. 1294 & 1295; A. E. MANSELL for No. 1299; T. H. MILLER for No. 1304; T. S. MINTON for No. 1308; P. A. MUNTZ, M.P., for No. 1313; J. L. NAPER for Nos. 1316, 1317, & 1318; JOHN PRICE for No. 1325; R. THOMAS for Nos. 1340 & 1341.

Class 116.—*Pen of Three Shropshire Ram Lambs, dropped in* 1892. [23 entries, 6 absent.]

1367 **I.** (**£10.**)—WM. KIRKHAM, Bangley Farm, Tamworth, born Feb. 1892.
1357 **II.** (**£5.**)—A. BRADBURNE, Hammerwick Place, Lichfield, born Mar. 1, 1892; *s.* Bonnie Ranger.

1360 **R. N. & H. C.**—R. BROWN, Ruyton Hall, Shrewsbury, born Feb. & Mar.
1375 **H. C.**—HENRY SMITH, Summerhill, Kingswinford.

Com.—T. & S. BRADBURNE for No. 1358; GEO. GRAHAM for No. 1364; H. PARKER for No. 1369; H. P. RYLAND for No. 1373.

Class 117.—*Pen of Three Shropshire Shearling Ewes, of the same flock.* [42 entries, 11 absent.]

1378 **I.** (**£15.**)—MRS. M. BARRS, Odstone Hall, Atherstone, born Mar. 1891.
1393 **II.** (**£10.**)—GEO. GRAHAM, The Oaklands, Birmingham, born Feb. 1891.
1394 **III.** (**£5.**)—W. F. Inge, Thorpe Hall, Tamworth, born about Feb. 20, 1891.
1395 **R. N. & H. C.**—W. F. INGE, born about Feb. 20, 1891.

H. C.—A. S. BERRY for No. 1379; T. & S. BRADBURNE for No. 1384; G. COOKE for No. 1387; GEO. GRAHAM for No. 1392; G LEWIS for No. 1396; P. A. MUNTZ, M.P., for No. 1401; G. THOMPSON for No. 1415.

Com.—H. BRADBURNE for No. 1383; R. P. COOPER for No. 1390; P. A. MUNTZ, M.P., for No. 1402; E. NOCK for No. 1403; H. SMITH for No. 1413; A. TANNER for No. 1414; G. THOMPSON for No. 1416; H. TOWNSHEND for No. 1418.

Class 118.—*Pen of Five Shropshire Ewes, which have suckled Lambs up to June* 15.[3] [9 entries, 2 absent.]

1425 **I.** (**£15.**)—T. S. MINTON, Montford, Salop, ages various.
1423 **II.** (**£10.**)—GEO LEWIS, Ercall Park, Wellington, Salop, born 1889 & 1890.

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[1] Given by the Warwick Local Committee for best Shropshire Ram in Classes 114 and 115.
[2] Given by the Shropshire Sheep Breeders' Association for the best Shropshire Ram in Classes 114 and 115.
[3] Prizes given by the Warwick Local Committee.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

1427 **R. N. & H. C.**—JOSEPH PULLEY, Lower Eaton, Hereford, ages various.
1422 **H. C.**—GEO. GRAHAM, The Oaklands, Birmingham.
Com.—J. BOWEN-JONES for No. 1421; T. H. MILLER for No. 1424; G. THOMPSON for No. 1428.

Class 119.—*Pen of Five Shropshire Ewe Lambs.*[1] [16 entries, 2 absent.]

1431 **I. (£15.)**—T. & S. BRADBURNE, Astwood Hill, Redditch, born Mar. 2, 1892.
1444 **II. (£10.)**—G. THOMPSON, Mousley End House, Wroxall, born Apr. 1, 1892; *s.* Squire of Wroxall, 5557.

1436 **R. N. & H. C.**—GEO. GRAHAM, The Oaklands, Birmingham.
H. C.—G. COOKE for No. 1434; W. F. INGE for No. 1437; H. PARKER for No. 1439.
Com.—E. BROUGHALL for No. 1432; C. PRATT for No. 1440.

Southdowns.

Class 120.—*Southdown Two-Shear Rams.* [21 entries, 1 absent.]

1462 **I. (£10.)**—THE DUKE OF RICHMOND & GORDON, K.G., born Feb. 1890.
1454 **II. (£5.)**—E. ELLIS, Summersbury, Shalford, Guildford, born Feb. 14, 1890.
1445 **R. N. & H. C.**—H.R.H. THE PRINCE OF WALES, K.G., born Mar. 2, 1890.
H. C.—J. J. COLMAN, M.P., for No. 1452; COL. SIR NIGEL KINGSCOTE, K.C.B., for No. 1458; THE DUKE OF RICHMOND & GORDON, K.G., for No. 1461; WM. TOOP for No. 1464.
Com.—A. DE MURRIETA for No. 1453; EDWIN ELLIS for No. 1455.

Class 121.—*Southdown Shearling Rams.* [40 entries, 3 absent.]

1474 **I. (£15.)**—J. J. COLMAN, M.P., Carrow Ho., Norwich, born Feb. 1891.
1482 **II. (£10.)**—THE DUKE OF HAMILTON & BRANDON, K.T., Easton, born Feb. 18, 1891.

1478 **III. (£5.)**—A. DE MURRIETA, Wadhurst Park, Sussex, born about Feb. 20, 1891.

1480 **R. N. & H. C.**—E. ELLIS, Summersbury, Shalford, born Feb. 14, 1891.
H. C.—H.R.H. THE PRINCE OF WALES, K.G., for Nos. 1466 & 1468; J. J. COLMAN, M.P., for No. 1475; A. HEASMAN for Nos. 1484 & 1485.
Com.—THE DUKE OF HAMILTON & BRANDON, K.T., for No. 1481; THE DUKE OF RICHMOND & GORDON, K.G., for No. 1500; SIR WM. THROCKMORTON, BT., for No. 1503.

Class 122.—*Pen of Three Southdown Ram Lambs, dropped in* 1892. [18 entries, 4 absent.]

1523 **I. (£10.)**—W. TOOP, Aldingbourne, Chichester, born about Feb. 14, 1892.
1519 **II. (£5.)**—PAGHAM HARBOUR CO., Selsey, Chichester, born abt. Feb. 10.
1511 **R. N. & H. C.**—A. DE MURRIETA, Wadhurst Park, Sussex, born Feb. 1892.
H. C.—J. J. COLMAN, M.P., for No. 1510; A. HEASMAN, for No. 1513.
1506 **Com.**—H.R.H. THE PRINCE OF WALES, K.G., born Mar. 1892.

Class 123.—*Pen of Three Southdown Shearling Ewes, of the same flock.* [25 entries, 4 absent.]

1531 **I. (£15.)**—J. J. COLMAN, M.P., Carrow Ho., Norwich, born Feb. 1891.
1533 **II. (£10.)**—A. DE MURRIETA, Wadhurst Park, Sussex, born Feb. 1891.

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[1] Prizes given by the Warwick Local Committee.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

1527 III. (£5.)—JAMES BLYTH, Wood House, Stansted, born Feb. 1891.
1534 **R. N. & H. C.**—E. ELLIS, Summersbury, Shalford, Guildford.
H. C.—H.R.H. THE PRINCE OF WALES, K.G., for No. 1525; F. M. JONAS, for No. 1538; THE DUKE OF RICHMOND & GORDON, K.G., for No. 1543.
Com.—JAMES BLYTH for No. 1528; THE DUKE OF HAMILTON & BRANDON, K.T., for No. 1535; WM. TOOP for No. 1547.

Hampshire Downs.

Class 124.—*Hampshire Two-Shear Rams.* [6 entries, 1 absent.]

1551 I. (£10.)—HENRY LAMBERT, Babraham, Cambridge, born Jan. 1890.
1550 II. (£5.)—R. COLES, Warminster, for **Victor IV.**, born about Jan. 28, 1890; *s.* Victor II.
1554 **R. N. & H. C.**—F. R. MOORE, Littlecott, Upavon, Wilts, born Jan. 1890.

Class 125.—*Hampshire Shearling Rams.* [21 entries, 7 absent.]

1567 I. (£15.)—HENRY LAMBERT, Babraham, Cambridge, born Jan. 1891.
1569 II. (£10.)—F. R. MOORE, Littlecott, Upavon, Wilts, born Jan. 1891.
1568 III. (£5.)—H. LE ROY LEWIS, Westbury Park, Petersfield, for **Bomble**, born Feb. 14, 1891.
1573 **R. N. & H. C.**—WM. NEWTON, Crowmarsh Battle, Wallingford, for **Sir Henry James** 564.
Com.—F. R. MOORE for No. 1570; WM. NEWTON for No. 1571.

Class 126.—*Pen of Three Hampshire Ram Lambs, dropped in* 1892. [16 entries, 4 absent.]

1585 I. (£10.)—WM. NEWTON, Crowmarsh Battle, Wallingford, born Jan. 1892.
1584 II. (£5.)—F. R. MOORE, Littlecott, Upavon, Wilts, born Jan. 1892.
1581 **R. N. & H. C.**—HENRY LAMBERT, Babraham, Cambridge, born Jan. 1892.
H. C.—T. FOWELL BUXTON, for No. 1577; ROBERT COLES for No. 1579.
Com.—T. FOWELL BUXTON for No. 1576.

Class 127.—*Pen of Three Hampshire Shearling Ewes, of the same flock.* [5 entries, 2 absent.]

1590 I. (£15.)—H. LE ROY LEWIS, Westbury Pk., Petersfield, born Feb. 14, 1891.
1592 II. (£10.)—W. NEWTON, Crowmarsh Battle, Wallingford, born Jan. 1891.
1593 **R. N. & H. C.**—THE EARL OF NORTHBROOK, Stratton Park, Hants.

Suffolks.

Class 128.—*Suffolk Two-Shear Rams.* [6 entries, 2 absent.]

1595 I. (£10.)—THE MARQUIS OF BRISTOL, Ickworth Park, Bury St. Edmunds, for **Vandellia** 1635, born Feb. 1890, bred by J. W. Eagle, Walton-on-Naze; *s.* Bold Prince 605.
1600 II. (£5.)—J. SMITH, Thorpe Hall, Hasketon, Woodbridge, born Feb. 1890.
1596 **R. N. & H. C.**—THE MARQUIS OF BRISTOL, for **Van Dyke VII.** 1637.

Class 129.—*Suffolk Shearling Rams.* [7 entries, 2 absent.]

1606 I. (£15.)—J. SMITH, Thorpe Hall, Hasketon, Woodbridge, born Feb. 1891
1605 II. (£10.)—E. GITTUS, Snailwell, Newmarket, for **Gold**, born Feb. 1891; *s.* Quite Royal II. 1555, *d. by* Bismarck V.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

1601 **III.** (£5.)—THE MARQUIS OF BRISTOL, Ickworth Park, Bury St. Edmunds, for **Duke of Tuddenham IV.** 1864, born Feb. 1, 1891; *s.* Duke of Tuddenham III. 962.

1607 **R. N.**—JOSEPH SMITH, Thorpe Hall, born Feb. 1891.

Class 130.—*Pen of Three Suffolk Ram Lambs, dropped in* 1892. [5 entries, 1 absent.]

1612 **I.** (£10.)—J. SMITH, Thorpe Hall Hasketon, Woodbridge, born Feb. 1892.
1608 **II.** (£5.)—THE MARQUIS OF BRISTOL, Ickworth Park, Bury St. Edmunds. born Jan. 25, 1892.
1611 **R. N. & H. C.**—HENRY LINGWOOD, The Chestnuts, Needham Market.
1609 **Com.**—THE MARQUIS OF BRISTOL, born Jan. 27, 1892.

Class 131.—*Pen of Three Suffolk Shearling Ewes, of the same flock.* [5 entries, none absent.]

1615 **I.** (£15.)—HENRY LINGWOOD, The Chestnuts, Needham Market, born Feb. & Mar. 1891; *ss.* Rifleman 491 & Bandmaster 1267.

1614 **II.** (£10.)—THE MARQUIS OF BRISTOL, Ickworth Park, Bury St. Edmunds, born Feb. 3, 1891.

1616 **III.** (£5.)—HENRY LINGWOOD, born Feb. & Mar. 1891; *s.* Rifleman IV. 1559.

1613 **R. N. & H. C.**—THE MARQUIS OF BRISTOL, born Feb. 1, 1891.

Border Leicesters.

Class 132.—*Border Leicester Rams, Two-Shear and Upwards.* [5 entries, 1 absent.]

1622 **I.** (£10.)—T. WINTER, Springfield Ho., Sherburn, born Mar. 1888, bred by S. Jack, Mersington.

1621 **II.** (£5.)—JOHN TWENTYMAN, Hawkrigg Ho., Wigton, born Mar. 1889 bred by John Fawcett, Torpenhow, Low Mill, Aspatria.

1619 **R. N. & H. C.**—THE RT. HON. A. J. BALFOUR, M.P., Whittinghame, N.B.
1620 **Com.**—S. JACK, Crichton Mains, Dalkeith, born Apr. 1, 1890.

Class 133.—*Border Leicester Shearling Rams.* [12 entries, none absent.]

1623 **I.** (£10.) & 1624 **II.** (£5.)—THE RT. HON. A. J. BALFOUR, M.P., Whittinghame, N.B., born Mar. 1891.

1625 **R. N. & H. C.**—S. JACK, Crichton Mains, Dalkeith, born Mar. 20, 1891. **H. C.**—T. WINTER for No. 1633, and **Com.** for No. 1634.

Class 134.—*Pen of Three Border Leicester Shearling Ewes, of the same flock.* [4 entries, none absent.]

1635 **I.** (£10.)—THE RT. HON. A. J. BALFOUR, M.P., Whittinghame, N.B., born Mar. 1891.

1638 **II.** (£5.)—T. WINTER, Springfield Ho., Sherburn, born Apr. 1891.
1637 **R. N. & H. C.**—JOHN TWENTYMAN, Hawkrigg House, Wigton.

Clun Forest.

Class 135.—*Clun Forest Rams, one-shear and upwards.* [No entry.]

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 136.—*Pen of Three Clun Forest Ewes* (*one-shear and upwards*), *of the same flock.* [No entry.]

Welsh Mountain.

Class 137.—*Welsh Mountain Rams, One-Shear and Upwards.* [5 entries, none absent.]

1639 I. (£10.)—JOHN JONES, Central Buildings, Llandudno, for **Brhenin Cymru**, born Mar. 1887; *s.* Champion.

1643 II. (£5.)—MRS. THOMAS, Nantymadog, Senny Bridge, Brecon, born Mar. 14, 1887.

1641 **R. N. & H. C.**—GODFREY PARRY, Carrog, Corwen, born Mar. 7, 1891.
Com.—JOHN JONES for No. 1640; GODFREY PARRY for No. 1642.

Class 138.—*Pen of Three Welsh Mountain Ewes* (*one-shear and upwards*), *of the same flock.* [5 entries, none absent.]

1646 I. (£10.)—GODFREY PARRY, Carrog, Corwen, born Mar. 1890.
1645 II. (£5.)—JOHN JONES, Central Buildings, Llandudno, ages various.
1647 **R. N. & H. C.**—GODFREY PARRY, Carrog, Corwen, born Mar. 1891.
H. C.—JOHN JONES for No. 1644; MRS. THOMAS for No. 1648.

Goats.[1]

Class 139.—*He Goats, over* 1 *year.* [2 entries.]

1649 I. (£4, & **Champion.**[2])—THE BARONESS BURDETT-COUTTS, Holly Lodge, Highgate, for **Garnet** 176 (British-Nubian), born Jan. 6, 1889; *s.* Ruby 81, *d.* Duchess 7.

1650 II. (£2 & **R. N. for Champion.**[2])—SIR HUMPHREY DE TRAFFORD, BT., Trafford Park, Manchester, for **Sir Juniper** (short-haired hornless), born May 17, 1891, bred by H. S. Holmes Pegler, Kings Langley; *s.* Garnet 176, *d.* Little Jane 243.

Class 140.—*She Goats, over* 2 *years.* [6 entries, none absent.]

1652 I. (£4, & **Champion.**[3])—THE BARONESS BURDETT-COUTTS, Holly Lodge, Highgate, for **Myrtle** 120, born Mar. 10, 1887; *s.* Ruby 81, *d.* Duchess 7.

1651 II. (£2.)—THE BARONESS BURDETT-COUTTS, for **Cornflower** (British-Nubian), born Jan. 1888; *s.* Ruby 81, *d.* Duchess 7.

1654 III. (£1.)—C. A. SMITH-RYLAND, Barford Hill, Warwick, for **Spider** 212 (English Hungarian), born Apr. 24, 1886, breeder unknown; *s.* Spot 19, *d.* Careless.

656 **R. N. & H. C.**—P. A. THOMAS, for **Queen of the Mountain** (Schwartzhals).
655 **H. C.**—F. T. STANLEY, Thurlaston, near Warwick (Cashmere or Angora).

Class 141.—*She Goats, over* 1 *year and under* 2 *years.* [1 entry.]

I. (£4.)—THE BARONESS BURDETT-COUTTS, Holly Lodge, Highgate, for **Blue Bell** 303, born Jan. 13, 1891; *s.* Garnet 176, *d.* Myrtle 120.

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[1] Prizes given by the Warwick Local Committee.
[2] Silver Medal given by the British Goat Society for the best male goat or kid.
[3] Silver Medal given by the British Goat Society for the best female goat or kid.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 142.—*Male Kids, not exceeding* 1 *year.* [1 entry.]

1658 I. (£4.)—THE BARONESS BURDETT-COUTTS, Holly Lodge, Highgate, for **Hornblende** (British-Nubian), born Jan. 3, 1892; *s.* Garnet 176, *d.* Duchess 2nd 248.

Class 143.—*Female Kids, not exceeding* 1 *year.* [4 entries.]

1660 I. (£4, & **R. N. for Champion.**[1])—MISS MABEL SYLVIA HOLMES PEGLER, Kings Langley, for **Jeanette** (Nubian-English), born May 21, 1891; *s.* Garnet, *d.* Little Jane.

1662 II. (£2.)—P. A. THOMAS, Devonport House, New Malden, for **Norma** (Toggenburg), born June 24, 1891; *s.* Champion Zampa 338, *d.* Amaltea.

1659 III. (£1.)—THE BARONESS BURDETT-COUTTS, Holly Lodge, Highgate, for **Marigold** 348, born Dec. 27, 1891; *s.* Young Barnet, *d.* Myrtle 120.

1661 R. N. & H. C.—C. A. SMITH-RYLAND, Barford Hill, Warwick, for **Polly**.

PIGS.

Large White Breed.

Class 144.—*Large White Boars, farrowed in* 1891.
[7 entries, 1 absent.]

1668 I. (£10.)—SANDERS SPENCER, Holywell Manor, St. Ives, Hunts, for **Holywell Minor**, born Jan. 3, 1891; *s.* Holywell Plymouth 1829, *d.* Holywell Squeak *by* Holywell Dairyman II. 1305.

1669 II. (£5.)—SANDERS SPENCER, for **Holywell Warwick**, born Jan. 3, 1891; *s.* Holywell Dublin, *d.* Holywell Midge II. *by* Holywell Doctor 975.

1665 III. (£3.)—GUARDIANS OF THE PRESCOT UNION, for **Belper II.**, born May 17, 1891; *s.* Prescot Joe 1389, *d.* Whiston 3, 2620 *by* Belper 671.

1667 R. N. & H. C.—SANDERS SPENCER, for **Holywell Major**, born Jan. 3, 1891.

Class 145.—*Pen of Three Large White Boar Pigs, farrowed in* 1892.
[8 entries, 1 absent.]

1674 I. (£10.)—SANDERS SPENCER, Holywell Manor, St. Ives, Hunts, born Jan. 10, 1892; *s.* Holywell Squire II. 1337, *d.* Holywell Bonny Girl *by* Holywell Joseph 1313.

1670 II. (£5.)—R. BODDINGTON, Colebrook Hall, Shirley, born Jan. 3, 1892; *s.* Colebrook King 1733, *d.* Colebrook Lass 3044 *by* Walsall Jack.

1677 III. (£3.)—G. THOMPSON, Mousley End House, Wroxall, born Feb. 20, 1892; *s.* Worsley General XI. 2043, *d.* Lady Anne *by* Worsley General X. 1095.

1675 R. N. & H. C.—SANDERS SPENCER, born Jan. 14, 1892.

1676 H. C.—SANDERS SPENCER, born Jan. 15, 1892; *s.* Holywell Jackie 989.

Class 146.—*Large White Breeding Sows, farrowed before or in* 1891.
[10 entries, 2 absent.]

1679 I. (£10.[2])—EDWIN BUSS, Elphicks, Horsmonden, for **Elphicks Daisy**, born June 1, 1890; *s.* Holywell Major 1321, *d.* Holywell Hoppicker II. *by* Holywell Nick 1003.

1684 II. (£5.)—DENSTON GIBSON, Metchley, Edgbaston, for **Miss Hough V.** 2416, born Nov. 6, 1888, bred by F. A. Walker Jones, Little Mollington, Chester; *s.* Madman III. 745, *d.* Miss Hough II. 1270 *by* Major 345.

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[1] Silver Medal given by the British Goat Society for the best female goat or kid.
[2] The Awards in this Class, and also in the Classes for other Breeding Sows, are subject to the prize-animals complying with the regulations of the Prize-Sheet as to farrowing.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

1686 III. (£3.)—SANDERS SPENCER, Holywell Manor, St. Ives, Hunts, for **Holywell Bonny Girl**, born Apr. 29, 1890; *s.* Holywell Joseph 1313, *d.* Holywell Bonny Lass *by* Holywell Judge 993.

1683 **R. N. & H. C.**—DENSTON GIBSON, for **Metchley Giantess.**

1680 **H. C.**—JOHN CASHMORE, JUN., for **Worsley Baroness III.**

1682 **Com.**—DENSTON GIBSON, for **Jenny.**

Class 147.—*Pen of Three Large White Sow Pigs, farrowed in* 1892. [7 entries, 1 absent.]

1689 I. (£10.)—DENSTON GIBSON, Metchley, Edgbaston, born Jan. 6, 1892; *s.* Duke 1263, *d.* Metchley Pride 3306 *by* Kingley 729.

1691 II. (£5.)—THE GUARDIANS OF THE PRESCOT UNION, Prescot. born Jan. 2, 1892; *s.* Prescot VI. 1387, *d.* Whiston V. 2624 *by* Ben III. 927.

1688 III. (£3.)—R. BODDINGTON, Colebrook Hall, Shirley, born Jan. 3, 1892; *s.* Colebrook King 1733, *d.* Colebrook Lass *by* 3044.

1693 **R. N. & H. C.**—SANDERS SPENCER, born Jan. 10, 1892.

1690 **H. C.**—DENSTON GIBSON, born Jan. 15, 1892; *s.* Metchley King.

Middle White Breed.

Class 148.—*Middle White Boars, farrowed in* 1891. [5 entries, none absent.]

1699 I. (£10.)—A. C. TWENTYMAN, Castlecroft, Wolverhampton, for **Consul**, born Jan. 5, 1891; *s.* Young Juan 1551, *d.* Rosy 2718 *by* Silver King 603.

1695 II. (£5.)—DENSTON GIBSON, Metchley, Edgbaston, for **Metchley Dandy**, born Jan. 1891, bred by the Earl of Ellesmere; *s.* Prince of Worsley 1527, *d.* Worsley Countess II. 918 *by* Peter 183.

1698 III. (£3.)—SANDERS SPENCER, Holywell Manor, St. Ives, Hunts, for **Holywell Thorn**, born Jan. 14, 1891; *s.* Holywell Slasher 2069, *d.* Holywell Rose *by* Holywell Swell 591.

1697 **R. N. & H. C.**—SANDERS SPENCER, for **Holywell Baron II.**, born Jan. 4.

Class 149.—*Pen of Three Middle White Boar Pigs, farrowed in* 1892. [1 entry.]

1700 I. (£10.)—SANDERS SPENCER, Holywell Manor, St. Ives, Hunts, born Jan. 12, 1892; *s.* Holywell Slasher 2069, *d.* Holywell Curly Girl *by* Holywell Silky IV. 1115.

Class 150.—*Middle White Breeding Sows, farrowed before or in* 1891. [6 entries, none absent.]

1701 I. (£10.[1])—DENSTON GIBSON, Metchley, Edgbaston, for **Metchley Dairymaid**, born June 20, 1889, bred by T. Strickland, Thirsk; *s.* Boswell II. 817, *d.* Thirsk Queen 1434 *by* Worsley King 607.

1703 II. (£5.)—SANDERS SPENCER, Holywell Manor, St. Ives, Hunts, for **Holywell Rissole**, born Jan. 3, 1889; *s.* Holywell Ponfield 1113, *d.* Holywell Curly *by* Curly 387.

1706 III. (£3.)—A. C. TWENTYMAN, Castlecroft, Wolverhampton, for **Fairy** 2664, born June 11, 1889; *s.* Silver King 603, *d.* Tiny 912 *by* The Earl 399.

H. C.—SANDERS SPENCER, for No. 1704, **Holywell Rose**; & **Com.** for No. 1702, **Holywell Curly Girl.**

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[1] As to the original awards in Class 150, see p. xci.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 151.—*Pen of Three Middle White Sow Pigs, farrowed in* 1892. [2 entries, 1 absent.]

1708 I. (£10.)—SANDERS SPENCER, Holywell Manor, St. Ives, Hunts, born Jan. 12, 1892; *s.* Holywell Slasher 2069, *d.* Holywell Curly Girl *by* Holywell Silky IV. 1115.

Small White Breed.

Class 152.—*Small White Boars, farrowed in* 1891. [2 entries, none absent.]

1709 I. (£10.)—THE HON. D. P. BOUVERIE, Coleshill House, Highworth, born June 23, 1891; *s.* King William 2097, *d.* Katherine III. *by* Prince.

Class 153.—*Pen of Three Small White Boar Pigs, farrowed in* 1892. [3 entries.]

1713 I. (£10.)—THE HON. D. P. BOUVERIE, Coleshill House, Highworth, born Jan. 17, 1892; *s.* Coleshill Farmer 2093, *d.* Shaftesbury 3678 *by* Prince.

1712 II. (£5.)—THE HON. D. P. BOUVERIE, born Jan. 5, 1892; *s.* King William 2097, *d.* Coleshill Beauty 3666 *by* Prince.

1711 R. N. & H. C.—W. A. TYSSEN AMHERST, M.P., born Feb. 3, 1892.

Class 154.—*Small White Breeding Sows, farrowed before or in* 1891. [4 entries.]

1717 I. (£10.)—THE GUARDIANS OF THE PRESCOT UNION, Prescot, for **Whiston Toy II.**, born Jan. 2, 1891; *s.* Prescot Toy 2099, *d.* Whiston Toy 3686 *by* Roger II.

1715 II. (£5.)—THE HON. D. P. BOUVERIE, Coleshill House, Highworth, for **Coleshill Pride**, born June 3, 1891; *s.* King William 2097, *d.* Coleshill Susan 3682 *by* Prince.

1714 R. N. & H. C.—W. A. TYSSEN AMHERST, M.P., for **Satin 2738.**

1716 H. C.—THE HON. D. P. BOUVERIE for **Coleshill Sunbeam 3670.**

Class 155.—*Pen of Three Small White Sow Pigs, farrowed in* 1892. [3 entries.]

1718 I. (£10.)—W. A. TYSSEN AMHERST, M.P., Didlington Hall, Brandon, born Feb. 5, 1892; *s.* Doncaster, *d.* Satin 2738 *by* Good Boy 155.

1720 II. (£5.)—THE HON. D. P. BOUVERIE, Coleshill House, Highworth, born Jan. 8, 1892; *s.* King William 2097, *d.* Katherine III. *by* Prince.

1719 R. N. & H. C.—THE HON. D. P. BOUVERIE, born Jan. 5, 1892.

Berkshire Breed.

Class 156.—*Berkshire Boars, farrowed in* 1891. [21 entries, 4 absent.]

1729 I. (£10.)—SIR HUMPHREY F. DE TRAFFORD, BT., Trafford Park, Manchester, for **Barton King** 3509, born Jan. 14, 1891; *s.* Barton Royal 3499, *d.* Barton Regina *by* Premier.

1732 II. (£5.)—EDNEY HAYTER, The Mount, Whitchurch, Hants, for **Halle**, born Apr. 28, 1891, bred by H. R. Eyers, Pimperne; *s.* Pygmalion II., *d.* Mab *by* Horton.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

1721 **III.** (£3.)—NATHANIEL BENJAFIELD, Shorts Green Farm, Motcombe, Dorset, born Aug. 5, 1891; *s.* Blunt 11, 2315, *d.* Marion 3294 *by* Competition 2043.

1722 **R. N. & H. C.**—C. A. BARNES, Solesbridge, Herts, for **Uncle Tom.**
H. C.—EDWARD BURBIDGE, for No. 1727; GILBERT GREENALL, for No. 1731, **Walton Don**; LORD WANTAGE, V.C., K.C.B., for No. 1741.
Com.—T. H. ATKINS, for No. 1721, **Comedy**; WM. A. BARNES, for No. 1723, **Sebastion Augustus.**

Class 157.—*Pen of Three Berkshire Boar Pigs, farrowed in* 1892. [15 entries, 1 absent.]

1746 **I.** (£10.)—A. E. W. DARBY, Little Ness, Shrewsbury, born Jan. 6 & 21, 1892; *s.* Big Ben 2204, *dd.* Peresphone 2496 *by* May Hill 1519 & Papaver *by* Attempt 2789.

1752 **II.** (£5.)—WM. PINNOCK, Littleworth House, Wantage, born Feb. 1, 1892; *s.* Columbus 3274, *d.* Wantage Poetess A *by* Longstop 2819.

1751 **III.** (£3.)—JAMES W. KIMBER, Fyfield Wick, Abingdon, born Jan. 25, 1892; *s.* Longstop 2819.

1742 **R. N. & H. C.**—T. H. ATKINS, Solihull Lodge, Shirley, born Jan. 3, 1892.
1754 **H. C.**—SIR C. F. SMYTHE, BT. 1747 **Com.**—A. E. W. DARBY.

Class 158.—*Berkshire Breeding Sows, farrowed before or in* 1891. [33 entries, 4 absent.]

1783 **I.** (**£10, & Champion, £10.**[1])—W. PINNOCK, Littleworth House, Wantage, born Mar. 6, 1891; *s.* Windsor's Supreme 2814, *d.* Taynton Poetess 2384 *by* Lad of the Manor.

1779 **II.** (**£5, & R. N. for Champion.**[1])—JAMES W. KIMBER, Fyfield Wick, Abingdon, born Jan. 18, 1891; *s.* Windsor's Supreme 2814, *d.* Magnetic *by* Tim of Taynton.

1759 **III.** (£3.)—WM. A. BARNES, Mona Cottage, Shirley, for **Marie Augustus II.** 3262, born Oct. 3, 1890; *s.* Random 1348, *d.* Marie Augustus 2075 *by* Maddington 1763.

1768 **R. N. & H. C.**—A. E. W. DARBY, Little Ness, Salop, for **Pentstemon II.**
H. C.—A. E. W. DARBY for No. 1767, **Pelargonium**; SIR HUMPHREY F. DE TRAFFORD, BT., for No. 1770, **Trafford Queen**; R. E. HORWOOD for No. 1777, **Musk**; COL. J. B. JENKINS for No. 1778; JAMES W. KIMBER for No. 1780.
Com.—NATHANIEL BENJAFIELD for Nos. 1761, 1762, and 1763; J. PITTMAN KING for No. 1782.

Class 159.—*Pen of Three Berkshire Sow Pigs, farrowed in* 1892. [16 entries, 3 absent.]

1793 **I.** (£10.)—NATHANIEL BENJAFIELD, Shorts Green Farm, Motcombe, born Jan. 15, 1892; *s.* Prime Minister 3295, *d.* Compton Queen 1678 *by* Warwick III. 844.

1801 **II.** (£5.)—JAMES W. KIMBER, Fyfield Wick, Abingdon, born Jan. 25, 1892; *s.* Longstop 2819.

1794 **III.** (£3.)—A. E. W. DARBY, Little Ness, Shrewsbury, born Jan. 6 & 29, 1892; *s.* Big Ben 2204, *dd.* Papaver *by* Attempt 2789 & Punchetta 2492 *by* May Hill 1519.

1803 **R. N. & H. C.**—RUSSELL SWANWICK, R.A.C. Farm, Cirencester.
H. C.—H.R.H. PRINCE CHRISTIAN, K.G., for No. 1790; T. H. ATKINS for No. 1791. **Com.**—A. S. GIBSON, for No. 1797.

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[1] Given by the British Berkshire Society for the best animal in Classes 156 & 158.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Any Other Black Breed.

Class 160.—*Boars, farrowed in* 1891. [3 entries.]

1806 I. (£10.)—THE DUKE OF HAMILTON & BRANDON, K.T., Easton Park, Wickham Market, born June 29, 1891, small black; *s.* Emperor 1197, *d. by* Dartmoor 913.

1808 II. (£5.)—GEORGE PETTIT, Friston, Saxmundham, born June 12, 1891, Suffolk; *s.* Danger 1193, *d.* Patty 2970.

1807 **R. N. & H. C.**—THE DUKE OF HAMILTON & BRANDON, K.T.

Class 161.—*Pen of Three Boar Pigs, farrowed in* 1892. [3 entries.]

1809 I. (£10.)—THE DUKE OF HAMILTON & BRANDON, K.T., Easton Park, Wickham Market, born Jan. 6, 1892, small black; *s.* Emperor 1197, *d. by* Dartmoor 913.

1811 II. (£5.) & 1810 (**R. N. & H. C.**)—GEORGE PETTIT, Friston, Saxmundham, born Jan. 12, 1892, Suffolk; *s.* Duke 915, *d.* Primrose 2124.

Class 162.—*Breeding Sows, farrowed before or in* 1891. [4 entries, none absent.]

1814 I. (£10.)—GEORGE PETTIT, Friston, Saxmundham, born Jan. 7, 1891, Suffolk; *s.* Duke 915, *d.* Primrose 2124.

1812 II. (£5.)—THE DUKE OF HAMILTON & BRANDON, K.T., Easton Park, Wickham Market, born Aug. 21, 1889, small black; *s.* Dartmoor 913, *d.* Empress 612 *by* Robert the Devil.

1813 **R. N. & H. C.**—THE DUKE OF HAMILTON & BRANDON, K.T., for **Chance.**

Class 163.—*Pen of Three Sow Pigs, farrowed in* 1892. [3 entries.]

1817 I. (£10.)—GEORGE PETTIT, Friston, Saxmundham, born Jan. 14, 1892, Suffolk; *s.* Duke 915, *d.* Patty 2970.

1816 II. (£5.)—THE DUKE OF HAMILTON & BRANDON, K.T., Easton Park, Wickham Market, born Jan. 6, 1892, small black; *s.* Dartmoor 913, *d. by* Rector.

1818 **R. N. & Com.**—FRANCIS SPARKES, Felpham, Bognor, small black.

Tamworth Breed.

Class 164.—*Tamworth Boars, farrowed in* 1891. [14 entries, none absent.]

1829 I. (£10.)—J. H. JORDAN, Clifford Hill, Stratford-on-Avon, born June 23, 1891; *s.* Wallace II. 1661, *d.* Duchesse *by* H.R.H. 1147.

1831 II. (£5.)—D. W. PHILIP, Whitacre, Coleshill, for **Whitacre Prince**, born June 14, 1891; *s.* Coleorton Duke 2127, *d.* Whitacre Pride 3938 *by* Gun Hill Prince, 1591.

1826 III. (£3.)—ROBERT IBBOTSON, The Hawthorns, Knowle, for **Lord Salisbury**, born June 17, 1891, bred by A. Ibbotson, Arley, Warwick; *s.* Goldfinch, *d.* Gun Hill Confidence *by* Gun Hill Prince 1591.

1825 **R. N. & H. C.**—ROBERT IBBOTSON, for **Lord Burleigh**, born Jan. 2, 1891. **Com.**—R. BODDINGTON for No. 1823, **Colebrook Royal**; E. DE HAMEL for No. 1824, **Middleton Mat.**

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 165.—*Pen of Three Tamworth Boar Pigs, farrowed in* 1892. [10 entries, 1 absent.]

1841 **I.** (£10.)—R. N. Sutton-Nelthorpe, Scawby Hall, Brigg, born Jan. 18, 1892; *s.* Fear None 2145, *d.* Scawby Black Eye *by* Foxhall.

1840 **II.** (£5.)—D. W. Philip, Whitacre, Coleshill, born Jan. 1, 1892; *s.* Coleorton Duke, 2127, *d.* Whitacre Pride 3938 *by* Gun Hill Prince 1591.

1842 **III.** (£3.)—Thomas Thompson, Holt Hall, Whitacre, Birmingham, born Jan. 1 & 13, 1892; *s.* Uncle John 2245, *dd.* Mainspring III. 3806 *by* Coral 1567 and Cherry 2760 *by* Rufus 1635.

1838 **R. N. & H. C.**—Robert Ibbotson, and **Com.** for No. 1837.

Class 166.—*Tamworth Breeding Sows, farrowed before or in* 1891. [14 entries, none absent.]

1852 **I.** (£10.)—John Norman, Jun., Tamworth, and Joseph Norman, Exhall, Coventry, for **Cliffe Belle** 4242, born Feb. 2, 1891; *s.* Plymouth Brother 2209, *d.* Red Queen 2062 *by* Redskin 421.

1847 **II.** (£5.)—Robert Ibbotson, The Hawthorns, Knowle, for **Knowle Duchess**, born Jan. 3, 1890; *s.* Royal George 1175, *d.* Whitacre Duchess 1558.

1850 **III.** (£3.)—Wm. H. Mitchell, Elmdene, Kenilworth, for **Kenilworth Beauty**, born Mar. 7, 1891; *s.* Samson III. 1639, *d.* Drayton Princess 2800, *by* Sambo II. 895.

1856 **R. N. & H. C.**—T. Watson, Whitacre Hall, Coleshill, for **Whitacre Queen VI.**
H. C.—Thomas Thompson for No. 1853, **Doncaster Royal Reserve**; Thomas Watson for No. 1855, **Whitacre Queen V.**

1851 **Com.**—Wm. H. Mitchell, Elmdene, Kenilworth, for **Kenilworth Lady.**

Class 167.—*Pen of Three Tamworth Sow Pigs, farrowed in* 1892. [8 entries, none absent.]

1862 **I.** (£10.)—D. W. Philip, Whitacre, Coleshill, born Jan. 1, 1892; *s.* Coleorton Duke 2127, *d.* Whitacre Pride 3938, *by* Gun Hill Prince 1591.

1859 **II.** (£5.)—Robert Ibbotson, Knowle, Warwick, born Jan. 3, 1892; *s.* Red Windsor 1629, *d.* Knowle Rosalind, *by* Dorridge Champion.

1863 **III.** (£3.)—R. N. Sutton-Nelthorpe, Scawby Hall, Brigg, born Jan. 18, 1892; *s.* Fear None 2145, *d.* Scawby Black Eye, *by* Foxhall.

1864 **R. N. & H. C.**—Thomas Thompson. 1860 **H. C.**—Robert Ibbotson.

POULTRY.

"Cock," "Hen," "Drake," "Duck," "Gander," and "Goose" are meant birds hatched before January 1st, 1892; and by "Cockerel," "Pullet," "Young Drake," and "Duckling" are meant birds hatched in 1892, before June 1st.

FOWLS.

Dorkings.

Class 168.—*Coloured Dorking Cocks.* [11 entries, 1 absent.]

3 **I.** (30*s.*)—J. & T. Currah, Woodcroft, Frosterley, Durham. 1888.
4 **II.** (15*s.*)—Mrs. T. W. L. Hind, The Hollins, Kendal. 1891.
6 **III.** (10*s.*)—A. C. Major, Langley, Slough.

9 **R. N. & H. C.**—G. E. B. Muzeen, Douthwaite Lodge, Kirby Moorside.
H. C.—James Cranston for No. 1; Miss M. Murray for No. 8; Jos. Wood for No. 10.

Class 169.—*Coloured Dorking Hens.* [9 entries, 1 absent.]

20 **I.** (30*s.*)—J. Wood, Withnell Hall, Chorley.
19 **II.** (15*s.*)—G. E. B. Muzeen, Douthwaite Lodge, Kirby Moorside.
17 **III.** (10*s.*)—A. C. Major, Langley, Slough.
14 **R. N. & H. C.**—J. & T. Currah, Woodcroft, Frosterley, Durham. 1889.
12 **H. C.**—James Cranston, Nunwood, Dumfries. Aged.

Class 170.—*Coloured Dorking Cockerels.* [6 entries, 1 absent.]

22 **I.** (30*s.*)—James Cranston, Nunwood, Dumfries, N.B. Jan.
25 **II.** (15*s.*)—J. W. Nicholls & Sons, Cardinham, Bodmin. Feb. 22.
23 **III.** (10*s.*)—R. B. Curteis, Ashenden, Tenterden, Kent.
26 **R. N. & H. C.**—Mrs. Geo. Ward, Bearnctt House, Wolverhampton. Jan.

Class 171.—*Coloured Dorking Pullets.* [11 entries, 1 absent.]

30 **I.** (30*s.*)—James Cranston, Nunwood, Dumfries, N.B. Jan.
29 **II.** (15*s.*)—H. Britten, Skirwith, Culgaith, Cumberland. Jan.
36 **III.** (10*s.*)—Mrs. Geo. Ward, Bearnett House, Wolverhampton. Jan.
28 **R. N. & H. C.**—Henry Britten, Skirwith, Culgaith, Cumberland. Jan.
H. C.—R. B. Curteis for No. 32; C. R. Lynn for No. 33.
35 **Com.**—Thomas Rymer.

Class 172.—*Silver-Grey Dorking Cocks.* [10 entries, none absent.]

44 **I.** (30*s.*)—A. C. Major, Langley, Slough.
41 **II.** (15*s.*)—James Cranston, Nunwood, Dumfries, N.B. Aged.
43 **III.** (10*s.*)—J. Hayhurst, Vine House, Milnthorpe, Westmoreland.
42 **R. N. & H. C.**—O. E. Cresswell, Morney Cross, Hereford. Over 1 year.
38 & 39 **H. C.**—Miss F. Tyssen Amherst, Didlington Hall, Norfolk.

Class 173.—*Silver Grey Dorking Hens.* [10 entries, 1 absent.]

51 **I.** (30*s.*) & 52 **II.** (15*s.*)—O. E. Cresswell, Morney Cross, near Hereford. Over 1 year.
55 **III.** (10*s.*)—J. Pettipher, Woodway House, Banbury. Over 1 year.
49 **R. N. & H. C.**—James Clunas, 76, High Street, Elgin, N.B. Apr. 1890.
H. C.—James Cranston for No. 50; A. C. Major for No. 54.

Class 174.—*Silver Grey Dorking Cockerels.* [9 entries, 1 absent.]

62 **I.** (30*s.*) & 61 **II.** (15*s.*)—James Cranston, Nunwood, Dumfries, N.B. Jan.
59 **III.** (10*s.*)—Thomas Briden, Cononby, Keighley. Jan. 9.
66 **R. N.**—Mrs. Wacher, Woodnesborough, Dover. Jan 1.
64 **Com.**—A. C. Major, Langley, Slough.

Class 175.—*Silver Grey Dorking Pullets.* [11 entries, 1 absent.]

70 **I.** (30*s.*)—James Clunas, 76, High Street, Elgin, N.B. Jan. 20.
72 **II.** (15*s.*) & 71 **III.** (10*s.*)—James Cranston, Nunwood, Dumfries, N.B. Jan.
68 **R. N. & H. C.**—Thomas Briden, Cononby, Keighley. Jan. 9.
H. C.—East Kent Poultry Farm for No. 73; A. C. Major for No. 74; Mrs. Wacher for No. 76.

Class 176.—*White or any other variety Dorking Cocks.* [5 entries, none absent.]

82 **I.** (30*s.*)—Joseph Pettipher, Woodway Ho., Banbury. White. Over 1 yr.
78 **II.** (15*s.*)—O. E. Cresswell, Morney Cross, Hereford. White. Over 1 yr

80 III. (10*s.*)—JOHN MITCHELL, 86, Coventry Rd., Birmingham. White. 1890.
79 R. N.—O. E. CRESSWELL, Morney Cross, Hereford. White. Over 1 year.

Class 177.—*White or any other variety Dorking Hens.* [8 entries, none absent.]

89 I. (30*s.*)—JOSEPH PETTIPHER, Woodway House, Banbury. Over 1 year.
85 II. (15*s.*) & 86 III. (10*s.*)—O. E. CRESSWELL, Morney Cross, Hereford. White. Over 1 year.
84 R. N. & H. C.—J. PEPLOE CARTWRIGHT, Brook Street House, Oswestry.
H. C.—JOHN MITCHELL for No. 87; J. PETTIPHER for No. 90.

Class 178.—*White or any other variety Dorking Cockerels.* [2 entries, 1 absent.]

92 II. (15*s.*)—WM. BURN, Phœnix House, Whitby. White. Feb.

Class 179.—*White or any other variety Dorking Pullets.* [1 entry, absent.]

Game.

Class 180.—*Old English Game Cocks.* [16 entries, none absent.]

107 I. (30*s.*)—S. D. STANLEY-DODGSON, Hames Hall, Cockermouth. 1891.
98 II. (15*s.*)—H. S. HALL, Dormington Court, Hereford. Apr. 1, 1890.
101 III. (10*s.*)—REV. H. W. HUTTON, Viears' Court, Lincoln. Mar. 1891.
97 R. N. & H. C.—JOHN BROUGH, 22, London Road, Carlisle.
H. C.—E. BARNES for No. 95; T. LITTLE for No. 102; J. NIXON for No. 103; T. ROPER for No. 104; J. W. SIMPSON for No. 106.

Class 181.—*Old English Game Hens.* [14 entries, 1 absent.]

120 I. (30*s.*)—G. F. SAUL, Brunstock, Carlisle. Mar. 1891.
113 II. (15*s.*)—JOHN GRAHAM, Mungrisdale, Greystoke, Penrith.
122 III. (10*s.*)—J. W. SIMPSON, Abbey Town, Silloth. 1890.
117 R. N. & H. C.—REV. H. W. HUTTON, Viears' Court, Lincoln. Feb. 1891.
H. C.—J. BROUGH for Nos. 111 & 112; H. S. HALL for No. 114; T. ROPER for No. 119; J. W. SIMPSON for No. 121.

Class 182.—*Old English Game Cockerels.* [10 entries, none absent.]

124 I. (30*s.*)—JOHN BROUGH, 22, London Road, Carlisle. Jan. 26.
131 II. (15*s.*) & 132 III. (10*s.*)—J. W. Simpson, Abbey Town, Silloth. Jan. 4.
129 R. N. & H. C.—MISS NORMAN, Moor Park, Kirkbampton, Carlisle.
H. C.—J. BROUGH for No. 125; J. Graham for No. 126.

Class 183.—*Old English Game Pullets.* [7 entries, none absent.]

134 I. (30*s.*)—JOHN BROUGH, 22, London Road, Carlisle. Jan. 26.
137 II. (15*s.*)—H. S. HALL, Dormington Court, Hereford. Jan. 20.
139 III. (10*s.*)—J. W. SIMPSON, Abbey Town, Silloth. Jan. 4.
138 R. N. & H. C.—THOMAS ROPER, Wetheral, Carlisle. Jan. 21.

Class 184.—*Indian Game Cocks.* [13 entries, 1 absent.]

145 I. (30*s.*)—JOHN FRAYN, St. Stephen's, Launceston. 1879.
149 II. (15*s.*)—A. H. HAWKEY, Wadebridge, Cornwall. 14 months.
150 III. (10*s.*)—HENRY PAYNTER, Carvoda Lezant, Callington. Over 1 year.
153 R. N. & H. C.—G. T. WHITFIELD, Colebridge, Gloucester.
H. C.—MRS. T. BROOK for No. 141; C. F. CLARK for No. 142; JAMES FRAYNE for No 146.

Class 185.—*Indian Game Hens.* [14 entries, 2 absent.]

165 I. (30*s.*)—HENRY PAYNTER, Carvoda Lezant, Callington.
163 II. (15*s.*)—A. H. HAWKEY, Wadebridge, Cornwall.
158 III. (10*s.*)—JOHN FRAYN, St. Stephen's, Launceston. 1879.
159 R. N. & H. C.—JAMES FRAYNE, Piper's Pool, Launceston. 1891.
H. C.—W. BANHAM for No. 154; A. H. HAWKEY for No. 164.

Class 186.—*Indian Game Cockerels.* [14 entries, 1 absent.]

174 I. (30*s.*)—TOM HAWKEY, Egloshayle, Wadebridge.
168 II. (15*s.*)—MRS. T. BROOK, Vine Street, Winkleigh. Jan.
171 III. (10*s.*) & 170 R. N. & H. C.—JOHN FRAYN, St. Stephen's, Launceston.
H. C.—J. N. JACKMAN for No. 175; A. H. STONE for No. 177; E. STRIKE for No. 178; T. TREBILCOCK for No. 179.

Class 187.—*Indian Game Pullets.* [11 entries, 1 absent.]

184 I. (30*s.*)—JOHN FRAYN, St. Stephen's, Launceston.
182 II. (15*s.*)—MRS. T. BROOK, Vine Street, Winkleigh. Jan.
185 III. (10*s.*)—JAMES FRAYNE, Piper's Pool, Launceston. Jan. 5.
188 R. N. & H. C.—J. N. JACKMAN, Burnville, Tavistock. Jan. 15.
H. C.—A. H. STONE for No. 190; T. WEBSTER, JUN., for No. 192.

Houdans.

Class 188.—*Houdan Cocks.* [6 entries, 1 absent.]

197 I. (30*s.*)—P. HANSON, Old Windsor. Over 1 year.
193 II. (15*s.*)—J. AINSWORTH, Highbank, Darwen. Over 1 year.
195 III. (10*s.*)—J. H. BRODRICK, Longbridge, Northfield, Worcs. Over 1 yr.

Class 189.—*Houdan Hens.* [4 entries, 1 absent.]

201 I. (30*s.*)—P. HANSON, Old Windsor. Over 1 year.
200 II. (15*s.*)—REV. F. COOKE, Clungunford Rectory, Aston-on-Clun. 1889.
202 III. (10*s.*)—S. W. THOMAS, Glasfryn, Forest Fach, Swansea. Over 1 yr.

Class 190.—*Houdan Cockerels.* [5 entries, 2 absent.]

205 I. (30*s.*)—REV. FREDERIC COOKE, Clungunford Rectory, Aston-on-Clun.
206 II. (15*s.*)—JONATHAN HILL, Bridgend Mills, Lostwithiel. Feb. 27.
207 III. (10*s.*)—J. HOLT, 347, Manchester Rd., Clifton, Manchester. Feb. 29.

Class 191.—*Houdan Pullets.* [5 entries, 2 absent.]

212 I. (30*s.*)—JONATHAN HILL, Bridgend Mills, Lostwithiel. Feb. 27.
210 II. (15*s.*) & 211 III. (10*s.*)—REV. FREDERIC COOKE, Clungunford Rectory, Aston-on-Clun.

Other French Breeds.

Class 192.—*Cocks.* [8 entries, none absent.]

214 I. (30*s.*) & 215 II. (15*s.*)—J. H. BRODRICK, Longbridge, Northfield, Worcs. Crèvecœur. Over 1 year.
217 III. (10*s.*)—J. RAWNSLEY, Langley Farm, Bingley. Crèvecœur. 3 yrs.
219 R. N. & H. C.—FRANCIS VALPY, St. Helier's, Jersey. Mar. 1891.
H. C.—S. W. THOMAS for No. 218; FRANCIS VALPY for No. 220.

Class 193.—*Hens.* [6 entries, none absent.]

222 I. (30*s.*)—J. H. BRODRICK, Longbridge, Northfield, Worcs.
224 II. (15*s.*)—S. W. THOMAS, Glasfryn, Forest Fach, Swansea. Crève. Over 1 year.

225 III. (10*s.*)—FRANCIS VALPY, St. Helier's, Jersey. Mar. 1891.
221 R. N. & H. C.—J. AINSWORTH, Highbank, Darwen. La Flêche. Over 1 yr.

Class 194.—*Cockerels.* [3 entries, 1 absent.]

229 I. (30*s.*) & 228 II. (15*s.*)—FRANCIS VALPY, St. Helier's, Jersey. Feb. 3.

Class 195.—*Pullets.* [3 entries, 1 absent.]

231 I. (30*s.*)—FRANCIS VALPY, 36, Colomberie, St. Helier's, Jersey. Feb. 3.

Brahmas.

Class 196.—*Brahma Cocks.* [7 entries, none absent.]

239 I. (30*s.*)—JOSEPH WOOD, Withnell Hall, Chorley.
234 II. (15*s.*)—RECHAB HOLLAND, Brahma Lodge, Buckingham. 18 months.
236 III. (10*s.*)—EDWARD SCAMMELL, Hilperton, Trowbridge.
233 R. N. & H. C.—JOHN BROOKE, Bingley Road, Heaton, Bradford, Yorks.
238 H. C.—S. W. THOMAS, Glasfryn, Forest Fach, Swansea.

Class 197.—*Brahma Hens.* [5 entries, none absent.]

243 I. (30*s.*)—J. TOMLINSON, Great Eccleston, Garstang.
241 II. (15*s.*)—RECHAB HOLLAND, Brahma Lodge, Buckingham. 18 months.
242 III. (10*s.*)—S. W. THOMAS, Glasfryn, Forest Fach, Swansea. Over 1 year.
244 R. N. & H. C.—JOSEPH WOOD, Withnell Hall, Chorley, Lancs.
240 Com.—JOHN BROOKE, Bingley Road, Heaton, Bradford.

Class 198.—*Brahma Cockerels.* [6 entries, 2 absent.]

247 I. (30*s.*)—DR. P. L. BENSON, Steeple Claydon, Bucks. Jan. 2.
249 II. (15*s.*)—REV. H. BURTON, Fauls Vicarage, Whitchurch, Salop. Jan. 1.
250 III. (10*s.*)—RECHAB HOLLAND, Brahma Lodge, Buckingham. Jan. 5.

Class 199.—*Brahma Pullets.* [7 entries, 1 absent.]

251 I. (30*s.*)—ALFRED ASHTON, Holmes Chapel, Cheshire. Jan.
254 II. (15*s.*)—REV. H. BURTON, Fauls Vicarage, Whitchurch, Salop. Jan. 15.
253 III. (10*s.*)—JOHN BROOKE, Bingley Road, Heaton, Bradford.
256 R. N. & H. C.—RECHAB HOLLAND, Brahma Lodge, Buckingham. Jan. 5.
252 Com.—ALFRED ASHTON, Holmes Chapel, Cheshire. Jan.

Cochins.

Class 200.—*Cochin Cocks.* [10 entries, none absent.]

261 I. (30*s.*)—MRS. KITE POWELL, Elm Lodge, Chesterfield. 1890.
265 II. (15*s.*)—MRS. SCRIVEN, Normandy Villa, Shipley. 1891.
258 III. (10*s.*)—RECHAB HOLLAND, Brahma Lodge, Buckingham. 18 months.
262 R. N. & H. C.—G. HENDERSON PROCTER, Flass House, Durham. 1890.
H. C.—JOSEPH WOOD for No. 267.
Com.—MRS. W. H. MITCHELL for No. 259; MRS. SCRIVEN for No. 264.

Class 201.—*Cochin Hens.* [10 entries, 4 absent.]

271 I. (30*s.*)—MRS. KITE POWELL, Elm Lodge, Chesterfield. 1890.
270 II. (15*s.*)—RECHAB HOLLAND, Brahma Lodge, Buckingham. 2½ years.
272 III. (10*s.*)—G. HENDERSON PROCTER, Flass House, Durham. 1890.
276 R. N. & H. C.—JOSEPH WOOD, Withnell Hall, Chorley, Lancs.

Class 202.—*Cochin Cockerels.* [5 entries, 1 absent.]

278 I. (30*s.*)—John Brooke, Bingley Road, Heaton, Bradford. Jan.
280 II. (15*s.*)—Rechab Holland, Brahma Lodge, Buckingham. Jan. 15.
277 III. (10*s.*)—John Brooke, Bingley Road, Heaton, Bradford. Jan.

Class 203.—*Cochin Pullets.* [7 entries, 3 absent.]

287 I. (30*s.*)—Rechab Holland, Brahma Lodge, Buckingham. Jan. 15.
286 II. (15*s.*)—Mrs. T. W. L. Hind, The Hollins, Kendal. Jan. 7.
283 III. (10*s.*)—John Brooke, Bingley Road, Heaton, Bradford. Jan.

Langshans.

Class 204.—*Langshan Cocks.* [22 entries, 1 absent.]

309 I. (30*s.*)—Harry Wallis, Northend, Warley, Brentwood, Essex. 1890.
305 II. (15*s.*)—H. P. Raines, Little Hadlow Poultry Yards, Buxted. 1891.
300 III. (10*s.*)—Abel Neild, Longfield Lane, Poulton-le-Fylde. 1891.
291 R. N. & H. C.—R. H. Cazalet, Castlemorton, Tewkesbury. 1891.
H. C.—H. M. Beart for No. 289; Mrs. F. Joynson for No. 295; S. Millard for No. 298; W. F. Mills for No. 299; C. Potts for No. 303; E. T. Procter for No. 304.
Com.—Rev. G. T. Laycock for No. 297; J. Thomas for No. 307.

Class 205.—*Langshan Hens.* [16 entries, 2 absent.]

319 I. (30*s.*)—Abel Neild, Longfield Lane, Poulton-le-Fylde. 1891.
317 II. (15*s.*)—Samuel Millard, Wotton, Gloucestershire. 1890.
326 III. (10*s.*)—Harry Wallis, Northend, Warley, Brentwood. 1889.
313 R. N. & H. C.—Frederick Davis, Woolashill, Pershore.

Class 206.—*Langshan Cockerels.* [15 entries, 3 absent.]

333 I. (30*s.*)—Marsden & Wallbank, Waddington, Clitheroe. Jan. 9.
329 II. (15*s.*)—East Kent Poultry Farm, Pluckley, Ashford. Jan. 1.
334 III. (10*s.*)—Abel Neild, Longfield Place, Poulton-le-Fylde. Jan. 2.
338 R. N. & H. C.—J. W. Walker, Upton Lodge, Henley-on-Thames. Jan

Class 207.—*Langshan Pullets.* [17 entries, none absent.]

355 I. (30*s.*)—J. W. Walker, Upton Lodge, Henley-on-Thames. Jan.
348 II. (15*s.*)—Rev. G. T. Laycock, Terwick Rectory, Petersfield. Jan. 5.
358 III. (10*s.*)—Lewis Wright, Cromford, Derbyshire. Jan. 19.
352 R. N. & H. C.—E. T. Procter, Cantsfield, Kirkby Lonsdale. Jan. 30.

Wyandottes.

Class 208.—*Wyandotte Cocks.* [11 entries, 2 absent.]

368 I. (30*s.*)—H. P. Raines, Little Hadlow Poultry Yards, Buxted, Sussex.
369 II. (15*s.*)—G. T. Whitfield, Colebridge, Gloucester.
359 III. (10*s.*)—Abbot Bros., Hingham, Norfolk. 1891.
365 R. N. & H. C.—W. H. Midgley, Scausby Hall, Bradshaw, near Halifax.
H. C.—Abbot Bros. for No. 360; Miss M. L. Ludlow for No. 364.

Class 209.—*Wyandotte Hens.* [10 entries, none absent.]

372 I. (30*s.*)—Rev. F. Cooke, Clungunford Rectory, Aston-on-Clun. 1891.
370 II. (15*s.*) & 371 III. (10*s.*)—Abbot Bros., Hingham, Norfolk. 1891.
377 R. N. & H. C.—Mrs. E. Oliver, Fletton, Peterborough. March 1890.

Class 210.—*Wyandotte Cockerels.* [14 entries, none absent.]

387 **I.** (30*s.*) & 386 **II.** (15*s.*)—Mrs. Franklin, Syston Old Hall, Grantham. Jan.
380 **III.** (10*s.*)—Abbot Bros., Hingham, Norfolk.
384 **R. N. & H. C.**—East Kent Poultry Farm, Pluckley, Ashford. Jan. 20.
H. C.—Mrs. M. M. Painter for No. 389; Mrs. S. H. Sandford for No. 392; G. Squibb for No. 393.

Class 211.—*Wyandotte Pullets.* [16 entries, 1 absent.]

394 **I.** (30*s.*) & 395 **II.** (15*s.*)—Abbot Bros., Hingham, Norfolk.
398 **III.** (10*s.*)—East Kent Poultry Farm, Pluckley, Ashford. Jan. 20.
407 **R. N. & H. C.**—H. P. Raines, Little Hadlow Poultry Yards, Buxted.
H. C.—Dr. P. L. Benson for No. 396; George Squibb for No. 409.

Plymouth Rocks.

Class 212.—*Plymouth Rock Cocks.* [15 entries, 1 absent.]

419 **I.** (30*s.*)—L. & S. Jackson, Manor Farm, Ringway, Cheshire. 2 years.
412 **II.** (15*s.*)—R. Butterfield, Nafferton Hall, Hull, Yorks. Over 2 years.
421 **III.** (10*s.*)—J. H. Peace, Northfield, Knowle, Warwick. May 1891.
420 **R. N. & H. C.**—G. E. B. Muzeen, Douthwaite Lodge, Kirby Moorside.
H. C.—Wm. Aston for No. 410; R. Butterfield for No. 413.

Class 213.—*Plymouth Rock Hens.* [14 entries, 1 absent.]

425 **I.** (30*s.*)—Joseph W. Adlington, Kirk Langley, Derby.
433 **II.** (15*s.*)—P. A. Farrer, Eccles, Attleborough, Norfolk. 1891.
437 **III.** (10*s.*)—J. H. Peace, Northfield, Manor Road, Knowle. Apr. 1890.
426 **R. N. & H. C.**—Joseph W. Adlington, Kirk Langley, Derby.
H. C.—R. Butterfield for No. 430; J. H. Peace for No. 436; S. W. Thomas for No. 438.

Class 214.—*Plymouth Rock Cockerels.* [16 entries, 3 absent.]

439 **I.** (30*s.*)—Abbot Bros., Hingham, Norfolk.
444 **II.** (15*s.*)—Express Dairy Co., Ltd., College Farm, Finchley, N. Jan 3.
453 **III.** (10*s.*)—J. W. Titt, Woodcock House, Warminster. Feb. 5.
443 **R. N. & H. C.**—East Kent Poultry Farm, Pluckley, Ashford. Jan 15.
H. C.—R. Butterfield for No. 441; Express Dairy Co., Ltd. for No. 445.

Class 215.—*Plymouth Rock Pullets.* [16 entries, 2 absent.]

469 **I.** (30*s.*)—J. Wallis Titt, Woodcock House, Warminster. Feb. 19.
457 **II.** (15*s.*)—Robert Butterfield, Nafferton Hall, Hull. Jan. 2.
463 **III.** (10*s.*)—L. & S. Jackson, Manor Farm, Ringway, Cheshire. 6 months.
468 **R. N. & H. C.**—Allan Tangye, Heathfield Hall, Birmingham. Feb. 6.
H. C.—H. Dickson for No. 458; L. H. & J. Nutter for No. 465.

Scotch Greys.

Class 216.—*Scotch Grey Cocks.* [No entry.]

Class 217.—*Scotch Grey Hens.* [1 entry, no award.]

Classes 218 & 219.—*Scotch Grey Cockerels and Pullets.* [No entries.]

Minorcas.

Class 220.—*Minorca Cocks.* [10 entries, none absent.]

476 **I.** (30*s.*)—A. G. Pitts, Highbridge, Somerset. May 1890.
473 **II.** (15*s.*)—A. Lewis, Cornhill, Bridgwater, Somerset. 1 year.
481 **III.** (10*s.*)—W. H. Stoyel, Bampton Street, Tiverton. May 1891.
474 **R. N. & H. C.**—T. T. Martin, Ivy House, St. Philip's Marsh, Bristol.
475 **H. C.**—A. G. Phillips, Long Ashton, Clifton, Bristol. 1891.

Class 221.—*Minorca Hens.* [17 entries, none absent.]

490 **I.** (30*s.*) & 491 **II.** (15*s.*)—A. G. Pitts, Highbridge, Somerset. Apr. 1891.
487 **III.** (10*s.*) & 486 **R. N. & H. C.**—J. H. Knowles-Morgan, Carter's Green, West Bromwich. Mar. & May 1891.
H. C.—Wm. Colton for No. 484; Wm. Peter for No. 489; Wm. Stribling for No. 496.

Class 222.—*Minorca Cockerels.* [7 entries, none absent.]

501 **I.** (30*s.*)—L. & T. Fawkes, Hammond's Farm, Stroud. Jan. 16.
505 **II.** (15*s.*)—Wm. Stribling, Colnbrook, Slough. Jan. 7.
504 **III.** (10*s.*)—W. H. Stoyel, Bampton Street, Tiverton. Jan. 8.

Class 223.—*Minorca Pullets.* [8 entries, 1 absent.]

510 **I.** (30*s.*)—M. W. & B. Holmes, Stonegate Farm, Low Bentham. Jan 16.
512 **II.** (15*s.*)—A. Lewis, Cornhill, Bridgwater, Somerset.
507 **III.** (10*s.*)—Harry Bloxsom, Gilmorton, Lutterworth. Jan. 3.
506 **R. N. & H. C.**—Abbot Bros., Hingham, Norfolk.

Andalusians.

Class 224.—*Andalusian Cocks.* [6 entries, none absent.]

519 **I.** (30*s.*) & 518 **II.** (15*s.*)—William Murray, Dene Villa, Hexham. 1891.
516 **III.** (10*s.*)—W. F. Le Boutillier, St. Helier's, Jersey. 1891.
515 **R. N.**—David Butterfield, 3, Laythorpe Terrace, E. Morton, Bingley.

Class 225.—*Andalusian Hens.* [13 entries, none absent.]

531 **I.** (30*s.*)—G. S. Oldham, Sherington, Newport Pagnell. May 1890.
524 **II.** (15*s.*)—W. F. Le Boutillier, 78, Roseville St., St. Helier's, Jersey. 1890.
522 **III.** (10*s.*)—D. Butterfield, 3, Laythorpe Ter., E. Morton, Bingley. 14 mths.
530 **R. N. & H. C.**—William Murray, Dene Villa, Hexham. 1891.
H. C.—Rev. E. R. O. Bridgeman for No. 521; J. McMillan for No. 527; A. C. Major for No. 528; E. Merrall for No. 529.

Class 226.—*Andalusian Cockerels.* [5 entries, none absent.]

536 **I.** (30*s.*)—Isaac W. Morriss, Chiefs Street, Ely. Jan 6.
537 **II.** (15*s.*)—James Pamment, Ingrow, Yorks. Jan. 6.
533 **R. N. & H. C.**—Abbot Bros., Hingham, Norfolk.

Class 227.—*Andalusian Pullets.* [7 entries, none absent.]

542 **I.** (30*s.*)—Isaac W. Morriss, Chiefs Street, Ely. Jan. 6.
541 **II.** (15*s.*)—Edwin Merrall, Manor Heath, E. Morton, Bingley. Jan. 2.
543 **III.** (10*s.*)—James Pamment, Ingrow, Yorks. Jan. 6.
539 **R. N. & H. C.**—D. Butterfield, 3, Laythorpe Ter., E. Morton, Bingley. Jan.
540 **H. C.**—S. Hoult, St. Michael's Hall, Garstang. Jan.

Leghorns.

Class 228.—*Leghorn Cocks.* [6 entries, none absent.]

550 I. (30*s.*)—WADE BROS., 58, Kirkgate, Silsden, Keighley.
547 II. (15*s.*)—MRS. A. C. LISTER-KAY, East Close, Christchurch. Mar. 1891.
546 III. (10*s.*)—G. F. HIGGINSON, Clarence House, Tenbury.
548 R. N. & H. C.—H. & A. P. SIMPSON, 266, Nottingham Road, Ilkeston. '91.

Class 229.—*Leghorn Hens.* [5 entries, 1 absent.]

551 I. (30*s.*)—H. & A. P. SIMPSON, 266, Nottingham Road, Ilkeston. 1891.
555 II. (15*s.*)—WADE BROS., 58, Kirkgate, Silsden, Keighley.

Class 230.—*Leghorn Cockerels.* [18 entries, 1 absent.]

563 I. (30*s.*)—C. W. KELLOCK, JUN., Highfields Hall, Audlem, Cheshire. Jan.
561 II. (15*s.*)—CHARLES HEATH, Thurgarton Priory, Southwell. Jan. 23.
564 III. (10*s.*)—MRS. A. C. LISTER-KAY, East Close, Christchurch, Hants. Jan.
569 R. N. & H. C.—J. W. RUSHWORTH, 20, Spring Bank, Ingrow, Keighley.
H. C.—A. ASHTON for No. 556; R. BUTTERFIELD for No. 557; MRS. A. C. LISTER-KAY for No. 565; NIXON & TILLOTSON for No. 566.

Class 231.—*Leghorn Pullets.* [20 entries, none absent.]

582 I. (30*s.*)—JOHN HURST, South Terrace, Glossop. Jan. 15.
575 II. (15*s.*)—BRIGGS & HAIGH, Carr Hall, Stainland, Halifax. Jan.
581 III. (10*s.*)—MRS. A. C. LISTER-KAY, East Close, Christchurch. Jan.
583 R. N. & H. C.—C. W. KELLOCK, JUN., Highfields Hall, Audlem, Cheshire.
H. C.—EAST KENT POULTRY FARM for No. 577; C. HEATH for No. 580; MRS. A. C. LISTER-KAY for No. 585; J. M. REVELL for No. 590.

Hamburghs.

Class 232.—*Hamburgh Cocks, any variety.* [3 entries.]

594 I. (30*s.*)—REV. S. ASHWELL, Finmere Rectory, Buckingham (Silver Spangled). Mar. 1891.
595 II. (15*s.*)—C. A. KEMBALL, Earls Acre, Plymouth (Black). Mar. 1891.
596 III. (10*s.*)—REV. G. T. LAYCOCK, Terwick Rectory, Petersfield.

Class 233.—*Hamburgh Hens, any variety.* [9 entries, 1 absent.]

601 I. (30*s.*)—C. A. KEMBALL, Earls Acre, Plymouth (Black). Mar. 1891.
605 II. (15*s.*)—J. TYRER, 20, Farfield, Kidderminster (Black). June 5, 1891.
604 III. (10*s.*)—JOHN RIDLEY, Peakfield Farm, Frosterley, *viâ* Darlington (Black). May 25, 1891.
602 R. N. & H. C.—REV. G. T. LAYCOCK, Terwick Rectory, Petersfield.
598 H. C.—MRS. C. F. COPEMAN, Hockley Heath, Birmingham (Black).

Class 234.—*Hamburgh Cockerels, any variety.* [3 entries, none absent.]

607 I. (30*s.*) & 608 II. (15*s.*)—M. JACKSON, High Green Farm, Silsden, Yks. Jan.

Class 235.—*Hamburgh Pullets, any variety.* [3 entries.]

610 I. (30*s.*)—MAURICE JACKSON, High Green Farm, Silsden, Yorks. Jan.
611 II. (15*s.*)—C. A. KEMBALL, Earls Acre, Plymouth (Black). Jan. 6.
609 III. (10*s.*)—W. GLOSSOP, Ambergate, Derbyshire (Silver Spangled). Feb.

Any Other Variety.[1]

Class 236.—*Cocks.* [19 entries, none absent.]

625 I. (30*s.*)—JOB RAWNSLEY, Langley Farm, Bingley (Polish). 2 years.
627 II. (15*s.*)—F. C. TOMKINS, 9, Lion Street, Kidderminster (Game). 1891.
622 III. (10*s.*)—J. PARTINGTON, Boothstown, Manchester (Polish). 2 years.
629 R. N. & H. C.—G. KEMP WALKER, The Cottage, Warwick (Orpington).
H. C.—ABBOT BROS. for No. 612; HEW CRAWFORD for No. 613; LOT HAKE for No. 615; JOHN HARWOOD for No. 617; MRS. W. H. MITCHELL for No. 619; MISS FRANCES MITFORD for No. 620; R. DE COURCY PEELE for No. 623; WM. PICKERING for No. 624; GEO. T. WHITFIELD for No. 630.

Class 237.—*Hens.* [16 entries, 1 absent.]

640 I. (30*s.*)—J. PARTINGTON, Boothstown, Manchester (Polish). 2 years.
646 II. (15*s.*)—G T. WHITFIELD, Colebridge, Gloucester (Aseel).
634 III. (10*s.*)—LOT HAKE, Mill House, Bridgwater, Somerset (Spanish). '91.
641 R. N. & H. C.—R. DE COURCY PEELE, Batchcott, near Ludlow (Aseel). '90.
H. C.—MISS FRANCES MITFORD for No. 638; H. MOSLEY-KAY for No. 639; JOB RAWNSLEY for No. 642; F. C. TOMKINS for No. 644; G. KEMP WALKER for No. 645.

Class 238.—*Cockerels.* [8 entries, none absent.]

654 I. (30*s.*)—J. SMITH, Keythorpe, Leicester (Black Spanish). Jan. 7.
647 II. (15*s.*)—HEW CRAWFORD, Hewitts, Chelsfield, Kent (Orpington). Jan. 3.
652 III. (10*s.*)—R. DE COURCY PEELE, Batchcott, Ludlow (Aseel). Jan. 3.
649 R. N. & H. C.—F. HARVEY, North St., Lostwithiel, Cornwall (Spanish). Jan.
653 H. C.—JOB RAWNSLEY, Langley Farm, Bingley, Yorks (Polish). Jan. 6.

Class 239.—*Pullets.* [9 entries, 1 absent.]

662 I. (30*s.*)—JOB RAWNSLEY, Langley Farm, Bingley, Yorks (Polish). Jan. 6.
663 II. (15*s.*)—J. SMITH, Keythorpe, Leicester (Black Spanish). Jan. 7.
655 III. (10*s.*)—H. CRAWFORD, Hewitts, Chelsfield, Kent (Orpington). Jan 3.
661 R. N.—R. DE COURCY PEELE, Batchcott, Ludlow (Aseel). Mar. 9.

Table Fowls.

Class 240.—*Pair of Cockerels of* 1892, *of any Pure Breed.* [7 entries, 1 absent.]

671 I. (30*s.*)—LADY WILSON, Chillingham Barns, Belford (Dorking). Jan. 16.
667 II. (15*s.*)—MISS DOLBEN, Ipsley Rectory, Redditch (Old English). Jan. 2.
665 III. (10*s.*)—RALPH ARTHUR, Torbryan Rectory, Newton Abbot (Indian Game). Mar. 20.
668 R. N. & H. C.—JOHN FRAYN, St. Stephen's, Launceston (Indian Game).

Class 241.—*Pair of Pullets of* 1892, *of any Pure Breed.* [8 entries, 1 absent.]

678 I. (30*s.*)—A. C. MAJOR, Langley, Slough (Dorking).
674 II. (15*s.*)—RALPH ARTHUR, Torbryan Rectory, Newton Abbot (Indian Game). Mar. 20.
672 III. (10*s.*)—J. W. ADLINGTON, Kirk Langley, Derby (Black Plymouth Rock). Feb. 18.
677 R. N. & H. C.—JAMES FRAYNE, Piper's Pool, Launceston (Indian Game).

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[1] Bantams excepted.

Class 242.—*Pair of Cockerels of* 1892, *of a First Cross from any Pure Breeds.* [10 entries, 2 absent.]

689 **I.** (**30***s.*)—LADY WILSON, Chillingham Barns, Belford (Indian Game & Dorking). Mar. 10.
680 **II.** (**15***s.*)—RALPH ARTHUR, Torbryan Rectory, Newton Abbot (Langshan & Indian Game). Mar. 20.
687 **III.** (**10***s.*)—GEO. T. WHITFIELD, Colebridge, Gloucester (Indian Game & Dorking).
681 **R. N. & H. C.**—RALPH ARTHUR (Langshan & Malay). Mar. 20.

Class 243.—*Pair of Pullets of* 1892, *of a First Cross from any Pure Breeds.* [10 entries, 3 absent.]

693 **I.** (**30***s.*)—MISS M. DOLBEN, Ipsley Rectory, Redditch (Old English Game & Dorking). Jan. 3.
699 **II.** (**15***s.*)—LADY WILSON, Chillingham Barns, Belford (Indian Game & Dorking). Mar. 10.
691 **III.** (**10***s.*)—RALPH ARTHUR, Torbryan Rectory, Newton Abbot (Langshan & Indian Game). Mar. 20.
695 **R. N. & H. C.**—P. B. GOVETT, Tideford, St. Germans (Game & Dorking). Feb. 10.

DUCKS.

Aylesbury.

Class 244.—*Aylesbury Drakes.* [6 entries, 1 absent.]

704 **I.** (**30***s.*)—JOB RAWNSLEY, Langley Farm, Bingley, Yorks. 3 years.
702 **II.** (**15***s.*)—H. HICKS, 3, Butt Street, South Street, Bedminster, Bristol.
705 **III.** (**10***s.*)—W. WESTON, 31 Mount Street, Aylesbury.
701 **R. N.**—S. BROWN, Southville, Bristol.

Class 245.—*Aylesbury Ducks.* [7 entries, 1 absent.]

707 **I.** (**30***s.*)—S. BROWN, Southville, Bristol. Over 1 year.
712 **II.** (**15***s.*)—W. WESTON, 31, Mount Street, Aylesbury.
711 **III.** (**10***s.*)—JOB RAWNSLEY, Langley Farm, Bingley, Yorks. 3 years.
708 **R. N.**—WM. BYGOTT, JUN., Rye Hill Farm, Uleeby. 1891.

Class 246.—*Aylesbury Young Drakes.* [4 entries, none absent.]

716 **I.** (**30***s.*)—WM. WESTON, 31, Mount Street, Aylesbury.
714 **II.** (**15***s.*)—H. HICKS, 3, Butt Street, Bedminster, Bristol. Mar. 11.
715 **III.** (**10***s.*)—MRS. W. H. MITCHELL, Elmdene, Kenilworth. Apr. 7.
713 **R. N.**—J. D. GOY, Swallowbeck, Lincoln. Feb. 13.

Class 247.—*Aylesbury Ducklings.* [4 entries, 1 absent.]

720 **I.** (**30***s.*)—WM. WESTON, 31, Mount Street, Aylesbury.
718 **II.** (**15***s.*)—H. HICKS, 3, Butt Street, South Street, Bedminster. Mar. 11.
717 **III.** (**10***s.*)—J. D. GOY, Swallowbeck, Lincoln. Feb. 13.

Rouen.

Class 248.—*Rouen Drakes.* [11 entries, 1 absent.]

729 **I.** (**30***s.*)—T. WAKEFIELD, Lowton, Newton-le-Willows. May 2, 1889.
726 **II.** (**15***s.*)—J. PARTINGTON, Vicar's Hall, Boothstown, Manchester. 2 yrs.
728 **III.** (**10***s.*)—R. J. SERGEANT, Thornton Abbey, Uleeby Junction. 2 years.
730 **R. N. & H. C.**—T. WAKEFIELD, Lowton, Newton-le-Willows, Lancs.
H. C.—WM. BYGOTT, JUN. for No. 723.
Com.—MISS TYSSEN AMHERST for No. 721; D. GARTON for No. 724; E. KENDRICK, JUN., for No. 725.

Class 249.—*Rouen Ducks.* [12 entries, none absent.]

739 I. (30*s.*)—J. PARTINGTON, Vicar's Hall, Boothstown, Manchester. 2 yrs.
741 II. (15*s.*)—R. J. SERGEANT, Thornton Abbey, Ulceby Junction. 18 mths.
736 III. (10*s.*)—REV. F. COOKE, Clungunford Rectory, Aston-on-Clun. 1888.
734 R. N. & H. C.—WM. BYGOTT, JUN., Rye Hill Farm, Ulceby. 1890.
H. C.—WM. BYGOTT, JUN., for No. 735; MRS. C. F. COPEMAN for No. 738; LADY WILSON for No. 743.
Com.—T. WAKEFIELD for No. 742.

Class 250.—*Rouen Young Drakes.* [4 entries, 2 absent.]

744 I. (30*s.*) & 745 II. (15*s.*)—WM. BYGOTT, JUN., Rye Hill Farm, Ulceby.

Class 251.—*Rouen Ducklings.* [4 entries, 2 absent.]

748 I. (30*s.*) & 749 II. (15*s.*)—WM. BYGOTT, JUN., Rye Hill Farm, Ulceby.

Pekin.

Class 252.—*Pekin Drakes.* [10 entries, 1 absent.]

760 I. (30*s.*)—J. PARTINGTON, Vicar's Hall, Boothstown, Manchester. 2 yrs.
755 II. (15*s.*)—S. BROWN, Southville, Bristol. Over 1 year.
761 III. (10*s.*)—A. G. PHILLIPS, Long Ashton, Clifton, Bristol.
756 R. N. & H. C.—SAMUEL BROWN, Southville, Bristol. Over 1 year.
757 H. C.—F. DAVIS, Woolashill, Pershore.

Class 253.—*Pekin Ducks.* [9 entries, none absent.]

765 I. (30*s.*)—S. BROWN, Southville, Bristol. Over 1 year.
767 II. (15*s.*)—FREDERICK DAVIS, Woolashill, Pershore.
764 III. (10*s.*)—S. BROWN, Southville, Bristol. Over 1 year.
770 R. N. & H. C.—A. G. PHILLIPS, Long Ashton, Clifton, Bristol.
H. C.—T. ALLEN for No. 762; J. PARTINGTON for No. 769.

Class 254.—*Pekin Young Drakes.* [6 entries, none absent.]

776 I. (30*s.*)—A. G. PHILLIPS, Long Ashton, Clifton, Bristol. Mar.
774 II. (15*s.*)—S. BROWN, Southville, Bristol. Mar. 3.
775 III. (10*s.*)—THOS. F. HORSLEY, South Grove, Highgate. Mar. 22.
773 R. N.—S. BROWN, Southville, Bristol. Mar. 3.

Class 255.—*Pekin Ducklings.* [6 entries, none absent.]

782 I. (30*s.*)—A. G. PHILLIPS, Long Ashton, Clifton, Bristol. March.
779 II. (15*s.*)—S. BROWN, Southville, Bristol. Mar. 25.
781 III. (10*s.*)—T. F. HORSLEY, South Grove, Highgate. Mar. 22.
778 R. N. & H. C.—MISS TYSSEN AMHERST, Didlington Hall, Norfolk. Apr.

Any Other Useful Breed.

Class 256.—*Drakes.* [5 entries, none absent.]

786 I. (30*s.*)—F. DAVIS, Woolashill, Pershore (Cayuga).
787 II. (15*s.*)—LADY WILSON, Chillingham Barns, Belford (Cayuga). 1891.
784 III. (10*s.*) & 783 R. N. & H. C.—MASTER R. ALLEN, Crookwood Farm, Devizes (Cayuga). June 1891.

Class 257.—*Ducks.* [4 entries, none absent.]

791 I. (30*s.*)—LADY WILSON, Chillingham Barns, Belford (Cayuga). 1891.
790 II. (15*s.*)—F. DAVIS, Woolashill, Pershore (Cayuga).
789 III. (10*s.*) & 788 R. N.—MASTER R. ALLEN, Crookwood Farm, Devizes (Cayuga).

Class 258.—*Young Drakes.* [1 entry.]

792 I. (30*s.*)—F. DAVIS, Woolashill, Pershore (Cayuga).

Class 259.—*Ducklings.* [1 entry.]

793 I. (30*s.*)—F. DAVIS, Woolashill, Pershore (Cayuga).

Table Ducks.

Class 260.—*Pair of Ducklings of* 1892, *of any Pure Breed.* [7 entries, 1 absent.]

798 I. (30*s.*)—WM. WESTON, 31 Mount Street, Aylesbury (Aylesbury).
797 II. (15*s.*)—H. G. WESTON, Mount Street, Aylesbury (Aylesbury).
796 III. (10*s.*)—H. E. THORNLEY, Radford Hall, Leamington (Aylesbury).

Class 261.—*Pair of Ducklings of* 1892, *of a First Cross from any Pure Breeds.* [4 entries, none absent.]

802 I. (30*s.*)—H. G. WESTON, Mount Street, Aylesbury (Aylesbury & Pekin).
803 II. (15*s.*)—G. T. WHITFIELD, Colebridge, Gloucester (Pekin & Aylesbury).

Geese.

Class 262.—*Ganders.* [7 entries, none absent.]

809 I. (£2.)—C. R. LYNN, Church Farm, Stroxton, Grantham (Toulouse). 1891.
807 II. (£1.)—D. BRAGG, Southwaite Hall, Carlisle (Embden). 1891.
811 III. (10*s.*)—EDWARD SHAW, Plâs Wilmot, Oswestry (Toulouse). Apr. 1890.
808 R. N. & H. C.—JOHN KERR, Red Hall, Wigton (Toulouse). 1891.
H. C.—MRS. BAYLDON for No. 806; R. PICKIN for No. 810.

Class 263.—*Geese.* [7 entries, none absent.]

816 I. (£2.)—JOHN KERR, Red Hall, Wigton (Toulouse). 1889.
814 II. (£1.)—D. BRAGG, Southwaite Hall, Carlisle (Toulouse).
818 III. (10*s.*)—R. PICKIN, Langside, Kilmarnock, Ayrshire (Toulouse). Aged.
817 R. N. & H. C.—C. R. LYNN, Church Farm, Stroxton (Toulouse). 1890.
H. C.—MISS TYSSEN AMHERST for No. 812; MRS. BAYLDON for No. 813.

Turkeys.

Class 264.—*Turkey Cocks.* [10 entries, 2 absent.]

823 I. (£2.)—W. H. CLARKE, Longbridge, Warwick (Cambridge Bronze). May 1, 1890.
822 II. (£1.)—R. BACH, Onibury, Craven Arms, Salop (Bronze). Over 1 year.
824 III. (10*s.*)—H. T. GOODENOUGH, Ronkswood House, Worcester (American Mammoth). May 20, 1891.
828 R. N. & H. C.—LADY WILSON (American Bronze). 1890.
H. C.—MRS. M. M. PAINTER for No. 826; MRS. GEO. WARD for No. 827.

Class 265.—*Turkey Hens.* [8 entries, 1 absent.]

833 I. (£2.)—E. KENDRICK, JUN., Weeford Ho., Lichfield (Bronze). Over 1 year.
831 II. (£1.)—H. T. GOODENOUGH, Ronkswood House, Worcester (American Mammoth). May 24, 1889.
836 III. (10*s.*)—LADY WILSON, Chillingham Barns, Belford. 1890.
834 R. N. & H. C.—MRS. G. WARD, Bearnett House, Wolverhampton. 1891.
H. C.—R. BACH for No. 830; MRS. G. WARD for No. 835.

FARM AND DAIRY PRODUCE OF THE UNITED KINGDOM.

Cheese.

Class 266.—*Three Cheddar Cheeses, of not less than* 50*lb. each, made in* 1892. [7 entries.]

2 **I.** (£10.)—T. C. Candy, Woolcombe, Cattistock, Dorset.
5 **II.** (£5.)—Sidney J. Martin, Waddon Farm, Lamyatt, Evercreech, Som.
3 **III.** (£3.)—Henry Cannon, Milton Clevedon, Evercreech, Som.
1 **R. N. & H. C.**—Blackmore Vale Dairy Co., Ltd., Lydlinch, Blandford.
7 **Com.**—N. J. Sims, Mitford, Shipston-on-Stour.

Class 267.—*Three Cheshire Cheeses, of not less than* 40*lb. each, made in* 1892. [16 *entries.*]

20 **I.** (£10.)—Richard Mullock, Poulton, Wrexham.
19 **II.** (£5.)—Richard Mullock, Guy Lane Farm, Waverton, Chester.
14 **III.** (£3.)—Thomas Dutton, Ash House, Brindley, Nantwich.
13 **R. N. & H. C.**—Benjamin Dutton, Baddiley Farm, Nantwich.
15 **H. C.**—Wm. Dutton. 23 **Com.**—T. Woolrich.

Class 268.—*Six Stilton Cheeses, of* 1892 *make.* [7 entries.]

26*a* **I.** (£10.)—H. Morris, Saxelby, Melton Mowbray.
30 **II.** (£5.)—W. S. Walpole, Twyford, Melton Mowbray.
26 **III.** (£3.)—Albert Hull, Frisby House, Billesdon, Leicester.
29 **R. N. & H. C.**—J. H. Wale, Burton Bandalls, Loughborough.
25 **Com.**—Mrs. Fairbrother, Beeby, Leicester.

Class 269.—*Three Cheeses of any other British make, made in* 1892. [20 entries.]

41 **I.** (£10.)—John Harrison, Pailton, Rugby.
39 **II.** (£5.)—W. Gilman, Cheese Factory, Rocester, Staffs.
34 **III.** (£3.)—Henry Cannon, Milton Clevedon, Evercreech, Som.
42 **R. N. & H. C.**—J. C. Harrison, Pailton Fields, Rugby.
43 **Com.**—T. F. King, Edgley, West Witton, Bedale.

Soft Cheese.

Class 270.—*Three Cream Cheeses.* [20 entries.]

69 **I.** (£3.)—C. C. Tudway, Walcombe Dairy, Wells, Som.
61 **II.** (£2.)—Mrs. A. Hopwood, Ketton Hall, Stamford.
67 **III.** (£1.)—W. A. Stiles, Claverdon, Warwick.
65 **R. N. & H. C.**—Thomas Palmer, Hampton Lodge, Warwick.
H. C.—E. Brough for No. 52 ; Mrs. R. Ibbotson for No 63.
Com.—Dovedale Company for No. 53 ; Higham Dairy and Produce Company for No. 59 ; G. A. M. Holland for No. 60.

Butter.

Class 271.—*Two pounds Fresh Butter, slightly salted, made up in pounds.* [95 entries.]

79 (£5.)—James Blyth, Wood House, Stansted, Essex.
83 (£5.)—Joseph Brutton, 7 Princes Street, Yeovil.
107 (£5.)—Mrs. A. Hopwood, Ketton Hall, Stamford.

119 (£5.)—THE EARL OF LONDESBOROUGH, Londesborough Park, Yorks.
92 (£3.)—MRS. A. DEANE, Minster House, Winchester.
100 (£3.)—THOMAS GOOCH, Bovingdon, Hemel Hempstead.
109 (£3.)—HON. MRS. C. HOWARD, Dutchlands, Great Missenden, Bucks.
140 (£3.)—WILLIAM H. ROW, Musbury, Axminster, Devon.
71 (£1.)—THOMAS ALLAN, Ryde Farm, Ripley, Surrey.
86 (£1.)—SAMUEL BOFFEY, Old Hall, Barthomley, Crewe.
88 (£1.)—MISS ELIZABETH CHURCH, Willington, Bedford.
104 (£1.)—J. C. HARRISON, Pailton Fields, Rugby.
121 **R. N. & H. C.**—E. MILES, Halton Rock Farm, Hampton Lucy, Warwick.
H. C.—JOHN BAGULEY for No. 75; MRS. H. R. PEEL for No. 133; C. C. TUDWAY for No. 155; WM. WINTER for No. 162.
Com.—S. F. BERRY for No. 78; EARL CADOGAN, K.G., for No. 84; MRS. T. COLE for No. 89; MRS. T. H. MILLER for No. 122; MRS. JAMES MORLEY for No. 126; GARRETT TAYLOR for No. 149; JOHN WILLIAMS for No. 159; W. G. WILLIAMS for No. 161.

Class 272.—*Six pounds Fresh Butter, made up in pounds, delivered 7 days prior to judging.*[1] [58 entries.]

168 **I.** (£6.)—MRS. BARNETT, Mill End, Henley-on-Thames.
190 **II.** (£5.)—MISS A. H. ILLINGWORTH, Pasture Field Ho., Newsham, Thirsk.
202 **III.** (£3.)—A. H. ROBINSON, Kirkby Hall, Hinckley.
175 } **IV.** { (10*s.*)—HON. MRS. A. CAMPBELL, Clynderwen Ho., Clynderwen.
203 } **IV.** { (10*s.*)—ALFRED ROSE, Over Whiteacre, Birmingham.
205 **R. N. & H. C.**—ARTHUR H. SAVORY, Aldington Manor, Evesham.
H. C.—W. H. MITCHELL for No. 194; MRS. H. R. PEEL for No. 199; H. SWITHINBANK for No. 211; JOHN WILLIAMS for No. 216.
Com.—T. ALLAN for No. 165; J. BRUTTON for No. 173; G. T. DRAKE for No. 181; MRS. E. SWAN for No. 210; LIEUT.-COL. L. TILLOTSON for No. 213; M. WOOTTEN for No. 221.

Class 273.—*One Keg or other Package of Salt Butter, not less than 14lb. in weight, delivered on or before May* 23. [11 entries.]

224 **I.** (£5.)—THE CATHEDRAL DAIRY CO., Exeter.
223 **II.** (£3.)—JOSEPH BRUTTON, 7 Princes Street, Yeovil.
225 **III.** (£2.)—GEORGE DODGE, Moat House, Steeple Claydon, Winslow.
222 **IV.** (£1.)—JAMES BLYTH, Wood House, Stansted, Essex.
231 **R. N. & H. C.**—W. G. WILLIAMS, Park Farm, Nempnett, Somerset.
226 **H. C.**—MRS. R. IBBOTSON. 229 **Com.**—C. C. TUDWAY.

CIDER AND PERRY.

Class 274.—*Cask of not less than* 18, *and not more than* 30, *gallons of Cider, made in the Autumn of* 1891. [7 entries.]

239 **I.** (£5.)—JOHN WATKINS, Pomona Farm, Withington, Hereford.
234 **II.** (£3.)—W. GAYMER & SON, Banham, Attleborough.
237 **III.** (£2.)—HENRY THOMSON, Southends, Newent, Gloucester.

Class 275.—*One Dozen Bottles of Cider, made in the Autumn of* 1891. [7 entries.]

246 **I.** (£5.)—JOHN WATKINS, Pomona Farm, Withington, Hereford.
244 **II.** (£3.)—HENRY THOMSON, Southends, Newent.
241 **III.** (£2.)—W. GAYMER & SON, Banham, Attleborough.

[1] Prizes given by the Warwick Local Committee.

Class 276.—*One Dozen Bottles of Cider, made in any year before 1891.* [10 entries.]

254 I. (£5.)—HENRY THOMSON, Southends, Newent.
251 II. (£3.)—EDWIN PALMER, West Clyst, Exeter.
256 III. (£2.)—JOHN WATKINS, Pomona Farm, Withington, Hereford.

Class 277.—*One Dozen Bottles of Perry.* [4 entries.]

259 I. (£5.)—HENRY THOMSON, Southends, Newent.
257 II. (£3.)—DANIEL PHELPS, Tibberton, Gloucester.
260 III. (£2.)—JOHN WATKINS, Pomona Farm, Withington, Hereford.

JAMS AND PRESERVED FRUITS.

Class 278.—*Collection of Whole Fruit Jams.* [5 entries.]

263 I. (£3.)—GRANGER'S FRUIT PRESERVING CO., LTD., The Vineyards, Ely.
265 II. (£2.)—NORTH LINCOLNSHIRE FRUIT PRESERVING WORKS, Grimsby.
264 III. (£1.)—LAMB BROS., Fruitfield, Richhill, Armagh, Ireland.

Class 279.—*Collection of Bottled Fruits.* [4 entries.]

268 I. (£3.)—NORTH LINCOLNSHIRE FRUIT PRESERVING WORKS, Grimsby.
269 II. (£2.)—WORCESTERSHIRE PRESERVING CO., LTD., Evesham.
267 III. (£1.)—GRANGER'S FRUIT PRESERVING CO., LTD., The Vineyards, Ely.

Class 280.—*Collection of Preserved Fruits for Dessert Purposes.* [No entry.]

Class 281.—*Collection of Dried or Evaporated Fruits for Cooking purposes.* [No entry.]

HIVES, HONEY, AND BEE APPLIANCES.[1]

Class 282.—*Collection of Hives and Appliances.* [5 entries.]

272 I. (£5)—W. P. MEADOWS, Syston, Leicester.
271 II. (£2 10*s.*)—C. REDSHAW, South Wigston, Leicester.

Class 283.—*Observatory Hive stocked with Bees and Queen.* [1 entry.]

275 I. (£1.)—C. T. OVERTON, Crawley, Sussex. Price £2 10*s.*

Class 284.—*Frame-hive for General Use, unpainted.* [13 entries.]

280 I. (£1.)—C. REDSHAW, South Wigston, Leicester. Price £1 4*s.*
283 II. (15*s.*)—G. NEIGHBOUR & SON, 127, High Holborn, W.C. Price £1 4*s.*
281 III. (10*s.*)—C. REDSHAW, South Wigston, Leicester. Price £1 1*s.*
286 H. C.—G. NEIGHBOUR & SON, 127, High Holborn, W.C. Price £1 10*s.*

Class 285.—*Frame-hive for Cottager's Use, unpainted.* [13 entries.]

298 I. (£1.)—G. NEIGHBOUR & SON, 127, High Holborn, W.C. Price 15*s.*
295 II. (15*s.*)—C. REDSHAW, South Wigston, Leicester. Price 10*s.* 6*d.*

[1] Prizes given by the British Bee-Keepers' Association.

296 III. (10*s.*)—C. REDSHAW, South Wigston, Leicester. Price 14*s.*
H. C.—C. REDSHAW for No. 294; GREEN & SONS for No. 297; W. P. MEADOWS for No. 299.

Class 286.—*Honey Extractors.* [6 entries.]

305 I. (15*s.*)—W. P. MEADOWS, Syston, Leicester. "Patent Raynor." Price £2 10*s.*
306 II. (10*s.*)—W. P. MEADOWS, Syston, Leicester. "New Guinea Extractor and Refiner." Price £1 1*s.*
304 H. C.—T. LOWTH, Riseholme, Lincoln. "Improved Unique." Price £1 5*s.*

Class 287.—*Pair of Section Racks, completely fitted for use and interchangeable.* [9 entries.]

312 I. (15*s.*)—G. NEIGHBOUR & SON, 127, High Holborn, W.C. Price 8*s.* 6*d.*
309 II. (10*s.*)—C. REDSHAW, South Wigston, Leicester. Price 8*s.* 6*d.*
314 III. (5*s.*)—HUTCHINGS BROS., St. Mary Cray, Kent. Price 8*s.* 6*d.*
310 H. C.—C. REDSHAW, South Wigston, Leicester. Price 7*s.*

Class 288.—*Rapid Feeders.* [6 entries.]

321 I. (10*s.*)—W. P. MEADOWS, Syston, Leicester. Price 3*s.*
319 II. (5*s.*)—C. REDSHAW, South Wigston, Leicester. Price 2*s.*
320 H. C.—G. NEIGHBOUR & SON, 127, High Holborn, W.C. Price 6*s.* 6*d.*

Class 289.—*Twelve Sections of Comb Honey, gathered* 1892. [17 entries.]

323 I. (£1.)—REV. G. W. BANCKS, Green St. Green, Dartford.
325 II. (10*s.*)—E. E. SMITH, Southfleet, Gravesend.

Class 290.—*Six Sections of Comb Honey, gathered* 1892. [17 entries.]

344 I. (£1.)—CAPTAIN W. S. ORD, Fornham House, Bury St. Edmunds.
340 II. (10*s.*)—GEO. BUSH, Rogate Lodge, Petersfield.
343 III. (5*s.*)—E. E. SMITH, Southfleet, Gravesend.

Class 291.—*Run or Extracted Honey, gathered* 1892. [15 entries.]

358 I. (£1.)—CAPTAIN W. S. ORD, Fornham House, Bury St. Edmunds.
367 II. (10*s.*)—W. WOODLEY, World's End, Newbury.
361 III. (5*s.*)—W. CHRISTIE MILLER, Broomfield, Chelmsford.

Class 292.—*Twelve Sections of Comb Honey, gathered before or in* 1891. [7 entries.]

377 I. (£1.)—W. P. MEADOWS, Syston, Leicester.
372 II. (10*s.*)—REV. G. W. BANCKS, Green St. Green, Dartford.
375 III. (5*s.*)—W. DIXON, Beckett Street, Leeds.

Class 293.—*Run or Extracted Honey, gathered before or in* 1891. [13 entries.]

386 I. (£1.)—W. DIXON, Beckett Street, Leeds.
383 II. (10*s.*)—T. BADCOCK, Southfleet, Kent.
384 III. (5*s.*)—W. CHRISTIE MILLER, Broomfield, Chelmsford.
H. C.—H. W. SEYMOUR for No. 382; W. P. MEADOWS for No. 390.

Class 294.—*Granulated Honey.* [13 entries.]

403 I. (£1.)—ETHEL CHESTER, Waltham, Melton Mowbray.
402 II. (10*s.*)—W. P. MEADOWS, Syston, Leicester.
392 III. (5*s.*)—J. D. MCNALLY, Laurencetown, Co. Down.
H. C.—S. J. COOPER for No. 394; W. CHRISTIE MILLER for No. 397.

Class 295.—*Best and most Attractive Display of Honey, in any form.* [5 entries.]

407 I. (£2 10*s.*)—W. WOODLEY, World's End, Newbury.
408 II. (£1 10*s.*)—W. P. MEADOWS, Syston, Leicester.
405 III. (10*s.*)—E. COOPER, St. Nicholas Square, Leicester.

Class 296.—*Useful Inventions introduced since* 1890. [12 entries.]

Silver Medal of British Bee-Keepers' Association.

410 W. J. SHEPPARD, King's Head Hill, Chingford: for Self Hiver.
411 R. BARTON, Garstang, Lancs.: for Heather Honey Press, price £1 16*s.*

413 **Com.**—JOHN TREBBLE, Romansleigh, South Molton: for Self Hiver.

Class 297.—*Most Interesting and Instructive Exhibit of any kind connected with Bee-culture not mentioned in the foregoing Classes, to which Prizes have not been previously awarded.* [2 entries.]

Silver Medal of British Bee-Keepers' Association.

423 G. NEIGHBOUR & SON, 127, High Holborn, W.C.: for Self Hiver.

422 **H. C.**—W. DIXON, Beckett Street, Leeds: for Honey Parkin Sample.

IMPLEMENTS.

Ploughs.

Distinguishing No. of Plough.

Class 1.—*Single-Furrow Ploughs, for light land.* [13 entries, 11 competing.]

1 I. (£10.)—WM. BALL & SONS, LTD., Rothwell, Kettering. B C 5. Price £4 19*s.*
4 II. (£5.)—THOMAS CORBETT, Shrewsbury. H L. Price £5 7*s.* 6*d.*

Class 2.—*Single-Furrow Ploughs, for strong land.* [11 entries, 8 competing.]

14 I. (£10.)—WM. BALL & SONS, LTD., Rothwell, Kettering, B C 9. Price £5 11*s.* 6*d.*
22 II. (£5.)—JOHN PERKINS & SONS, Lichfield. W P U. Price £5 10*s.*

Class 3.—*Single-Furrow Ploughs, best adapted for Press Drill and Broadcast Sowing.* [8 entries, 6 competing.]

27 I. (£10.)—THOMAS CORBETT, Shrewsbury. W W I. Price £5 17*s.* 6*d.*
32 II. (£5.)—J. C. & T. YATES, Doncaster. D 1. Price £5 5*s.*

Class 4.—*Two-Furrow Ploughs.* [8 entries, all competing.]

33 I. (£10.)—WM. BALL & SONS, LTD., Rothwell, Kettering. B C 4 D. Price £9 7*s.* 6*d.*
40 II. (£5.)—J. C. & T. YATES, Doncaster. D W. Price £8.

Class 5.—*Three-Furrow Ploughs.* [4 entries, 3 competing.]

43 I. (£10.)—J. C. & T. YATES, Doncaster. T E. Price £8 10*s.*

Class 6.—*Digging Ploughs, for light land.* [10 entries, 9 competing.]

18 **I.** (£10.)—Thomas Corbett, Shrewsbury. W C D. Price £4 5*s.*
54 **II.** (£5.)—J. C. & T. Yates, Doncaster. G 2. Price £4.

Class 7.—*Digging Ploughs, for heavy land.* [9 entries, 6 competing.]

62 **I.** (£10.)—John Perkins & Sons, Lichfield. M 2. Price £4.
57 **II.** (£5.)—Thomas Corbett, Shrewsbury. W D. Price £4 10*s.*

Class 8.—*One-way Ploughs.* [9 entries, 7 competing.]

67 **I.** (£10.)—Davey, Sleep, Harris, & Co., Plymouth. "Climax." Price £8 12*s.* 6*d.*

Second Prize of £5 equally divided.
68 (£2 10*s.*)—Davey, Sleep, Harris & Co. Plymouth. "The Invincible." Price £8 10*s.*
69 (£2 10*s.*)—Eddy & Sons, Kenford, Exeter. K A. Price £5 15*s.*

No. in Implement Catalogue.

Silver Medals for Implements.

3102 George Cotton & Co., Willaston, Crewe: for Hand Riddles, Patent, for Potatoes, &c.
4015 T. C. Fawcett, Hunslet, Leeds: for Brick and Tile Making or Pressing Machine combined, "Fawcett's Patent."
5191 J. A. Partridge, Tenbury: for Stringer Patent, in conjunction with Patent Continuous String System for Hop-yards.

BUTTER-MAKING COMPETITIONS.

Class 1.—*Open to the United Kingdom.* [19 entries.]

14 **I.** (£6.)—Miss Annie Sharman, Prebendal Ho., Lyddington, Uppingham.
16 **II.** (£4.)—Miss Agnes A. Walker, Ockington, Dymock, Glos.
12 **III.** (£3.)—Mrs. Maria Milner, Stretton, Alfreton.
19 **IV.** (£2.)—Alfred Worman, Walcombe Dairy, Wells, Som.
9 **V.** (£1.)—Miss Ada E. Haddon, Priory Farm, Maxstoke, Coleshill.
10 **R. N. & H. C.**—Miss Annie E. Haddon, Priory Farm, Maxstoke, Coleshill.

Class 2.—*Female Members of a Farmer's Family, not in Service or Working for Wages.* [23 entries.]

40 **I.** (£6.)—Miss Agnes A. Walker, Ockington, Dymock, Glos.
38 **II.** (£4.)—Miss Annie Sharman, Prebendal Ho., Lyddington, Uppingham.
21 **III.** (£3.)—Miss Rosamond Charles, Great Wacton, Bromyard.
35 **IV.** (£2.)—Mrs. Maria Milner, Stretton, Alfreton.
22 **V.** (£1.)—Miss Elizabeth Church, Willington, Bedford.
23 **R. N. & H. C.**—Miss Elsie G. Cook, House Farm, Ashford, Staines.

Class 3.—*Dairymaids in Service who have never won a Prize exceeding 1l. in value at any Competition.* [3 entries.]

45 **I.** (£6.)—Miss Mary Wilson, Stretton, Alfreton.
43 **II.** (£4.)—Miss Catherine Jones, Kilford Farm, Denbigh.
44 **V.** (£1.)—Miss Mabel Whiles, 208, Dorset Street, Leicester.

Class 4.—*Dairymaids residing in the Society's District F, consisting of the Counties of Gloucester, Hereford, Monmouth, Salop, Stafford, Warwick, and Worcester and of South Wales.* [8 entries.]

53 **I. (£6.)**—Miss Agnes A. Walker, Ockington, Dymock, Glos.
47 **II. (£4.)**—Miss Mary L. Farrin, Coleshill.
51 **III. (£3.)**—Miss Annie E. Haddon, Priory Farm, Maxstoke, Coleshill.
50 **IV. (£2.)**—Miss Ada E. Haddon, The Priory Farm, Maxstoke, Coleshill.
46 **V. (£1.)**—Miss S. A. H. Digwood, The Chesterfields, Feckenham, Redditch.
48 **R. N. & H. C.**—Miss Charlotte G. Greves, Highfield, Corley, Coventry.

Champion Class.—*Prize Winners in Classes* 1 *to* 4. [10 entries.]

40 **(£5 & Society's Silver Medal.)**—Miss Agnes A. Walker, Ockington, Dymock, Glos.
14 **R. N. & H. C.**—Miss Annie Sharman, Lyddington, Uppingham.
19 **H. C.**—Alfred Worman, Walcombe Dairy, Wells, Som.
21 **H. C.**—Miss Rosamond Charles, Great Wacton, Bromyard.
22 **H. C.**—Miss Elizabeth Church, Willington, Bedford.
35 **H. C.**—Mrs. Maria Milner, Stretton, Alfreton.
46 **H. C.**—Miss S. A. H. Digwood, The Chesterfields, Feckenham, Redditch.
47 **H. C.**—Miss Mary L. Farrin, Coleshill.
50 **H. C.**—Miss Ada E. Haddon, The Priory Farm, Maxstoke, Coleshill.
51 **H. C.**—Miss Annie E. Haddon, The Priory Farm, Maxstoke, Coleshill.

HORSE-SHOEING COMPETITIONS.

LIMITED TO SHOEING-SMITHS IN THE COUNTIES OF GLOUCESTER, HEREFORD, MONMOUTH, SALOP, STAFFORD, WARWICK, AND WORCESTER, AND IN SOUTH WALES.

Class 1.—*Roadsters.* [22 entries.]

4 **I. (£6.[1])**—David Blow, 48, Chapel Street, Warwick.
7 **II. (£4.)**—John Hands, Shipston-on-Stour.
2 **III. (£3.)**—Thomas Alcock, 2, Windsor Street, Leamington.
16 **IV. (£2.)**—John Pugsley, Pentonville, Newport, Mon.
14 **V. (£1.)**—Thomas Poole, Victoria Cottage, Shirley, Birmingham.
13 **H. C.**—Tom Pitt, 10, Bond St., Maindee, Newport, Mon.
15 **H. C.**—David Price, Nelson, Treharris, Glamorgan.
20 **H. C**—John R. Webster, Little Aston, Sutton Coldfield, Birmingham.
17 **Com.**—W. W. Roberts, Broadway, Worcester.
19 **Com.**—Wm. Watts, Green Dragon Shoeing Forge, Hereford.

Class 2.—*Dray Horses.* [7 entries.]

24 **I. (£6.[1])**—Henry A. V. Hopton, Jun, 76, Hare Lane, Gloucester.
25 **II. (£4.)**—Thomas Powis, Nelson, Treharris, Glamorgan.
27 **III. (£3.)**—George W. Waldren, 27 Tavistock Street, Leamington.
26 **IV. (£2.)**—Wm. Sparrow, Stivichall, Coventry.
29 **V. (£1.)**—J H. Williams, Church Road, St. George, Bristol.
23 **Com.**—Charles Field, Radford End, Harbury, Leamington.
28 **Com.**—J. P. Webster, Little Aston, Sutton Coldfield, Birmingham.

[1] Given by the Worshipful Company of Farriers, in addition to the Freedom of their Guild

FARM PRIZE COMPETITIONS.[1]

Class 1.—*Arable and Grass Farm of over* 250 *acres, not less than one-third being Arable.* [9 entries.]

7 **I.** (£80.)—JOHN PALMER, Hampton-on-Hill, Warwick.
8 **II.** (£40.)—HENRY E. THORNLEY, Radford Hall, Leamington.
3 **III.** (£20.)—JOSEPH HAWKES, Bearley Grange, Stratford-on-Avon.
5 **R. N.**—JOHN JAMES, Whitchurch Farm, Stratford-on-Avon.
1 **H. C.**—E. A. CUBBERLEY, Moor Hall, Alcester.
2 **H. C.**—W. HOWLETT GRIMES, JUN., Long Itchington, Rugby.

Class 2.—*Arable and Grass Farm of over* 150 *and not exceeding* 250 *acres, not less than one-third being Arable.* [10 entries.]

14 **I.** (£60.)—JOSIAH DENNY, Budbrooke, Warwick,
12 **II.** (£40.)—RICHARD COLES, Offchurch, Leamington.
18 **R. N.**—JOHN R. REEVE, Lillington, Leamington.

Class 3.—*Arable and Grass Farm of over* 50 *and not exceeding* 150 *acres.* [7 entries.]

26 **I.** (£40.)—LEWIS WILLDAY, Dunton, Minworth, Birmingham.
24 **II.** (£20.)—ANNA BOLTON SPENCER & S. K. SPENCER, The Mount, Black Hill, Snitterfield, Stratford-on-Avon.
25 **R. N.**—CHARLES THORNTON, Curdworth, Birmingham.

GRATUITIES TO FARM SERVANTS.

The Council have awarded Certificates of Distinguished Merit in the discharge of their duties, together with a gratuity of one sovereign in each case, to the following servants on the competing farms:—

Class 1.

Recommended by Mr. H. E. Thornley:—

SAMUEL ROBINS, for 55 years' service. A "practical, efficient, and thorough all-round farm labourer."

THOMAS ROSE, for 40 years' service as shepherd. A "thoroughly responsible shepherd, and looks after the stock placed under his care equally as well as though they were his own."

CHARLES HAWLEY, for 35 years' service. A "practical, trustworthy, and efficient farm labourer."

Recommended by Mr. E. A. Cubberley:—

WILLIAM HARTLAND, for $8\frac{1}{4}$ years' service as cowman. "Most valuable servant, hard-working, trustworthy, willing, and sober. An excellent stockman, poultry-rearer, gardener, and all-round man."

Recommended by Mr. John James:—

THOMAS NEWMAN, for between 40 and 50 years' service, with four successive masters. "Thoroughly deserving. Has been employed as carter, cowman and groom." Is 77 years of age.

MARTIN TAYLOR, 38 years of age. Has worked on the farm all his life. Is an excellent workman at carting, drilling, mowing, machinery, and any heavy work.

Class 2.

Recommended by Mr. Richard Coles:—

WILLIAM ROSE, for 40 years' service. A "good all-round labourer. Always borne a good character. Can mow, hedge, ditch, drain, build ricks, thatch, shear sheep, &c."

ALFRED ROSE (son of preceding), has been cowman and attending to cattle for 22 years.

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[1] Prizes given by the Warwick Local Committee.

Recommended by Mr. C. A. Pratt:—

WILLIAM RICHARDS, Senr., for 20 years' service. WILLIAM RICHARDS, Junr., for 18 years' service. Have always borne excellent characters. The former specially recommended as shepherd, groom, and milkman, the latter as waggoner.

Class 3.

Recommended by Mr. Lewis Willday:—

SAMUEL BOTT, for 26½ years' service. "Is thoroughly reliable, honest, and sober, and a good all-round husbandman."

Recommended by Mrs. Spencer and Mr. S. K. Spencer.

RICHARD SMITH, for 28 years' service as shepherd, &c. "Sober, honest, and industrious, and studious of his master's interests."

PRIZES OFFERED BY WARWICK LOCAL COMMITTEE.

STOCK AND PRODUCE, £545; FARMS, £300.

Class		Prizes 1st £	2nd £	3rd £
	HUNTERS.			
2	Mare or Gelding, up to 15 st., foaled 1886 or 1887	25	15	10
3	Mare or Gelding, up to 12 st., foaled 1886 or 1887	25	10	5
4	Mare, foaled in 1888	25	10	5
5	Gelding, foaled in 1888	25	10	5
6	Gelding, foaled in 1889	15	10	5
	HACKNEYS.			
15	Mare or Gelding, above 14 hands, up to 15 st., foaled in 1886, 1887, or 1888	15	10	5
16	Mare or Gelding, above 14 hands, up to 12 st., foaled in 1886, 1887, or 1888	15	10	5
	PONIES.			
19	Mare or Gelding, above 13 and not over 14 hands	10	5	–
20	Mare or Gelding, not above 13 hands	10	5	–
	HARNESS HORSES AND PONIES.			
21	Mare or Gelding, of any age, above 14 hands	15	10	–
22	Mare or Gelding, of any age, not above 14 hands	15	10	–
	AGRICULTURAL HORSES.			
40	Gelding, foaled in 1889	10	5	–
41	Gelding, foaled in 1890	10	5	–
	HEREFORD CATTLE.			
49–55	Two Champion Prizes, £15 each, for best Male and best Female	30	–	–
	LONGHORN CATTLE.			
68	Bull, calved 1888, 1889, or 1890	10	–	–
69	Cow or Heifer, of any age, in-milk or in-calf	10	–	–
	OXFORD DOWN SHEEP.			
110–111	Champion Prize for best Ram in classes 110–111	10	–	–
	SHROPSHIRE SHEEP.			
114–115	Champion Prize for best Ram in classes 114–115	15	–	–
118	Pen of five Ewes	15	10	–
119	Pen of five Ewe Lambs	15	10	–
	GOATS.			
139	He Goat, over 1 year	4	2	1
140	She Goat, over 2 years	4	2	1
141	She Goat, over 1 year and under 2 years	4	2	1
142	Male Kid, not over 1 year	4	2	1
143	Female Kid, not over 1 year	4	2	1
	BUTTER.			
272	Six pounds fresh Butter, delivered 7 days before judging	6	5	3
	do do 4th Prize	–	–	1

CHAMPION PRIZES.

Champion and other Prizes offered by various Societies, through the Roya Agricultural Society of England, at the Warwick Meeting.

HORSES.

HACKNEY HORSE SOCIETY:
Best Hackney stallion, and best Hackney mare: Gold Medals.

SHIRE HORSE SOCIETY:
Best Shire stallion and best Shire mare or filly: Gold Medals.

CLYDESDALE HORSE SOCIETY:
Best Clydesdale stallion and best Clydesdale mare or filly: £20 each.

CATTLE.

SHORTHORN SOCIETY:
Best Shorthorn male and best Shorthorn female: £25 each.

WARWICK LOCAL COMMITTEE:
Best Hereford male and best Hereford female: £15 each.

RED POLLED SOCIETY:
Best Red Polled animal: £10 10*s*.

SHEEP.

WARWICK LOCAL COMMITTEE:
Best Oxford Down Ram: £10.
Best Shropshire Ram: £15.

SHROPSHIRE SHEEP BREEDERS' ASSOCIATION:
Best Shropshire Ram: Gold Medal.

GOATS.

BRITISH GOAT SOCIETY:
Best male Goat and best female Goat or Kid: Silver Medals.

PIGS.

BRITISH BERKSHIRE SOCIETY:
Best Berkshire Boar or Sow: £10.

MEMORANDA.

Address of Letters.—All letters on the general business of the Society should be addressed to the Secretary, at 12 Hanover Square, London, W.

Telegrams.—The Society's registered address for telegrams is "Practice, London." *Replies by telegraph cannot be sent unless paid for in advance, and cannot be guaranteed in any case.*

Telephone Number 3675.

Office Hours.—10 to 4. On Saturdays, 10 to 2.

General Meeting in London, THURSDAY, DECEMBER 8, 1892, at noon, in the large Hall of the Royal Medical and Chirurgical Society, 20 Hanover Square, W.

Country Meeting at CHESTER, MONDAY, JUNE 19, TO FRIDAY, JUNE 23, 1893 (both inclusive).

Monthly Council (for transaction of business), at noon on the first Wednesday in every month, excepting January, September, and October: open only to Members of Council and to Governors of the Society.

Adjournments.—The Council adjourn over Passion and Easter weeks when those weeks do not include the first Wednesday of the month; from the first Wednesday in August to the first Wednesday in November; and from the first Wednesday in December to the first Wednesday in February.

Subscriptions.—1. *Annual.*—The subscription of a Governor is £5, and that of a Member £1, due in advance on the 1st of January of each year, and becoming in arrear if unpaid by the 1st of June.

2. *For Life.*—Governors may compound for their subscriptions for future years by paying on election, or at any time thereafter, the sum of £50, and Members by paying £15. Members elected before 1890 may compound at any time on payment of £10 in one sum; and Members elected in or subsequently to 1890 may compound for the same amount after the payment of ten annual subscriptions. Governors and Members who have paid their annual subscription for 20 years or upwards, and whose payments are not in arrear, may compound for future annual subscriptions, that of the current year inclusive, by a single payment of £25 for a Governor, and £5 for a Member. No Governor or Member can be allowed to enter into composition for life until all subscriptions due by him at the time shall have been paid.

No Governor or Member in arrear of his subscription is entitled to any of the privileges of the Society.

All Members belonging to the Society are, under the Bye-laws, bound to pay their annual subscriptions until they shall withdraw from it by notice in writing to the Secretary

Payments.—Subscriptions may be paid to the Secretary, either at the office of the Society, No. 12 Hanover Square, London, W., or by means of crossed cheques or crossed postal orders, made payable to "The Royal Agricultural Society of England." When making remittances, it should be stated by whom, and on whose account, they are sent. All cheques and postal orders should be crossed "London and Westminster Bank, St. James's Square Branch."

On application to the Secretary, forms may be obtained for authorising the regular payment, by the bankers of individual members, of each annual subscription as it falls due. Members are particularly invited to avail themselves of these bankers' orders, in order to save trouble both to themselves and to the Society. When payment is made to the London and Westminster Bank, as the Bankers of the Society, it will be desirable that the Secretary should be advised by letter of such payment, in order that the entry in the Bankers' book may be at once identified, and the amount posted to the credit of the proper person. No coin can be remitted by post unless the letter be registered.

Journal.—The Parts of the Society's Journal are (when the subscription is not in arrear) forwarded by post to Members, or delivered from the Society's Office to Members or to the bearer of their written order.

The back numbers of the Journal are kept constantly on sale by the publisher, Mr. JOHN MURRAY, 50A Albemarle Street, W.

New Members.—Every candidate for admission into the Society must be nominated by a Governor or Member, and must duly fill up and sign an application for Membership on the appointed form. Forms of Proposal may be obtained on application to the Secretary, or the form on next page may be utilised for this purpose. The Secretary will inform new Members of their election by letter.

ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

Proceedings of the Council,

WEDNESDAY, NOVEMBER 2, 1892,

THE DUKE OF WESTMINSTER, K.G. (PRESIDENT), IN THE CHAIR.

Present:—

Trustees.—Earl Cathcart, Mr. John Dent Dent, Lord Egerton of Tatton, Col. Sir Nigel Kingscote, K.C.B., Sir A. K. Macdonald, Bart., Right Hon. Sir M. W. Ridley, Bart., M.P.

Vice-Presidents.—H.R.H. Prince Christian, K.G., Mr. Chandos-Pole-Gell, Right Hon. Henry Chaplin, M.P., Mr. Walter Gilbey, Lord Moreton, Sir J. H. Thorold, Bart., Mr. Charles Whitehead.

Other Members of Council.—Mr. G. M. Allender, Mr. J. H. Arkwright, Mr. Alfred Ashworth, Mr. J. Bowen-Jones, Lord Brougham and Vaux, Mr. Charles Clay, Earl of Coventry, Mr. Percy E. Crutchley, Lieut.-Col. J. F. Curtis-Hayward, Mr. Alfred Darby, Mr. S. P. Foster, Mr. W. Frankish, Mr. R. Neville-Grenville, Mr. Anthony Hamond, Mr. Joseph Martin, Mr. T. H. Miller, Hon. Cecil T. Parker, Mr. Albert Pell, Mr. Dan. Pidgeon, Mr. G. H. Sanday, Mr. A. J. Smith, Mr. Henry Smith, Duke of Sutherland, Mr. Martin J. Sutton, Mr. Garrett Taylor, Mr. J. P. Terry, Mr. R. A. Warren, Mr. C. W. Wilson.

Officers.—Mr. Ernest Clarke, Secretary; Dr. Fream, Editor of the Journal; Dr. J. Augustus Voelcker, Consulting Chemist; Mr. W. Carruthers, F.R.S., Consulting Botanist; Professor J. B. Simonds, Consulting Veterinary Surgeon; Mr. Wilson Bennison, Surveyor.

The following members of the Chester Local Committee were also present: The Mayor of Chester (Mr. Charles Brown), the Town Clerk of Chester (Mr. Samuel Smith), the City Surveyor of Chester (Mr. J. Matthews Jones), Mr. George A. Dickson (Secretary of the Local Committee).

Apologies for Non-attendance.

Apologies for non-attendance were received from Viscount Bridport, Mr. Jos. Beach, Mr. J. A. Caird, Mr. James Hornsby, Mr. Charles Howard, Mr. C. S. Mainwaring, Mr. E. W. Stanyforth, Mr. Richard Stratton, Mr. J. Tremayne, Mr. E. V. V. Wheeler, and Sir Jacob Wilson.

Election of New Governors and Members.

The minutes of the last monthly meeting of the Council, held on July 27, having been approved, the election of the following two Governors and forty-seven members was then proceeded with:

Governors.

ESSEX, Earl of,..Cassiobury, Watford.
HAREWOOD, Earl of,..Goldsboro' Hall, Yorks.

Members.

BARRETT, H...Old Wolverton, Bucks.
BERESFORD, J...Baxterley, Atherstone.
BINGLEY, T. H...Whitley Hall, Sheffield.
BOWEN, G. W. H...Iekleton, Saffron Walden.
CAMERON, A...Malmesbury.
CHAMBERLAIN, W...Pinwall Hall, Atherstone.
CHAPLIN, B. J...Fulbourn, Cambridge.
CONODON, D...Wakeley, West Mill, Herts.
DANIELS, J. J...27, Dunsmure St., N.
DAVIES, S...Llyswen, R.S.O., Brecon.
DEVERILL, J...High Street, Slough.
DODD, H...Bruera, Saighton, Chester.
DOWSETT, C. F...3, Lincoln's Inn Fields, W.C.
FORREST, T. F...The Querns, Circneester.
FORRESTER, W...Malmesbury, Wilts.
GARNETT, H. M...Demerara, West Indies.

GARTSIDE, W... Fanfield, Whitchurch, Salop.
HANKEY, Lt.-Col. W. A... Beaulieu, Hastings.
HERBERT, Sir Robert G. W., G.C.B... Ickleton (Cambs), Great Chesterford, Essex.
HUGHES, G. C... King's Wick, Sunninghill.
KENDALL, T... High Ground, Coniston, Lancs.
KENDRICK, J... Stone Park, Stone, Staffs.
KNOWLES, H... Hunsingore, Wetherby.
LISTER, J. K.. Park Hill, Doncaster.
MALCOLM, L... Huskards, Ingatestone, Essex.
MART, W... Trentham, Stoke-on-Trent.
NEAVE, Capt. A. T. D... Hulton Hall, Essex.
OSGERBY. T. G... Horse Shoe Bridge, Spalding.
PARKER, L. H... Melford Hall, Long Melford.
PARKIN, A. O... 22, Park Lane, W.
RAWLENCE, J. E... The Chantry, Wilton, Wilts.
ROBINS, J... The Lodge Farm, Alcester.
ROBINSON, J... Nedderton, Northd.
SHAWE, Capt. D... 17th Lancers, Hounslow.
SIMMONS, C... Stilstead House, Tonbridge,
SMITH, H. F... Ventonwyn, Grampound.
SMITH, K. J... Little Moyle, Carlow.
SMITH, W... Halmonds Froome, Bromyard.
SPEKE, C... Wormwood Farm, Box, Wilts.
STANLEY, A. S. W... Great Chesterford, Essex.
SUMMERS, F. B... Hagloe Ho., Blakeney, Glos.
THOMPSON, C. F... 49, King Street, Lancaster.
THORNTON, W. B... The Abbey, Staveley, Kndl.
WARD, T. I... Chieveley, Newbury.
WHITE, R. F. H... Aghavol Grange, Ballacolla, Abbeyleix, Queen's County.
WOOD, H... 97, Gresham Street, E.C.
WRIGHT, T. H... The Hermitage, Thrapston.

Special Officers Committee.

Sir JOHN THOROLD (Chairman) presented the first report of a Special Committee appointed to inquire into the duties and responsibilities of the several officers and officials of the Society. Having taken evidence from the Secretary, and considered a memorandum prepared by him as to his duties, the Committee were of opinion that in view of the large increase in the number of members and the general extension of the Society's operations, it was necessary to relieve him from the extra work caused by the quarterly publication of the Journal. They had therefore unanimously agreed to recommend that the Secretary should be released from his responsibilities as Editor of the Journal, with the exception of the business arrangements connected with its publication and the Society's official reports; and that Dr. William Fream should be appointed Editor of the Journal, at a remuneration of 500*l.* per annum.

This report was unanimously adopted, and Sir JOHN THOROLD announced that the Committee proposed to sit again in December, to consider other matters connected with the administration of the Society's affairs.

Finance.

Sir NIGEL KINGSCOTE (Chairman) reported that the accounts for the period ended October 29, 1892, as certified by the Society's Accountants, showed that the total receipts for that period were 6,750*l.* 9*s.* 8*d.*, and the expenditure 12,219*l.* 5*s.* 7*d.* The balance at the Bankers on October 29, allowing for cheques outstanding, was 5,280*l.* 18*s.* 11*d.* Accounts amounting in all to 2,710*l.* 0*s.* 5*d.* had been passed, and were recommended for payment. The quarterly statement of subscriptions and arrears, and of the Society's property as at September 30, 1892, was laid upon the table. The draft balance-sheet for the Warwick Meeting, showing an excess of receipts over expenditure amounting to about 2,050*l.*, had been approved, and ordered to be submitted to the auditors. The Committee recommended that Parr's Banking Company, Limited, be appointed Local Bankers for the Chester Meeting.

Sir NIGEL KINGSCOTE, in presenting this report, said he thought the Council might like to know that the accounts for the Society's Meeting at Warwick last June came out more favourably than could have been expected, especially in view of the persistent downpour on the Thursday—usually the popular day of the show. The total receipts were in round figures 800*l.* less than at Doncaster, mainly arising from the shrinkage in the takings at the turnstiles, and in one or two minor items the expenses were greater; but, on the other hand, there were substantial reductions in the cost of building the showyard, owing to the number of entries of horses being considerably smaller, in advertising, and in management generally, whilst the amount spent in prizes was 1,000*l.* less than in 1891. The final result, therefore, subject to audit, was an excess of receipts over expenditure amounting to 2,050*l.*, as against 100*l.* last year. (Hear, hear.)

House.

Sir NIGEL KINGSCOTE (Chairman) also presented a report from this Committee as to various repairs and alterations in the Society's house.

Journal.

Earl CATHCART (Chairman) reported the concurrence of the Committee in the recommendation made by the Special Committee that the Secretary should be released from his responsibilities as Editor of the Journal, and that Dr. Fream be appointed Editor. The Committee presented their recommendations for the payment of various accounts for literary contributions and printing in connection with Part III. of the Journal, published on September 30 last. The Committee had considered the proposed arrangements for the next number of the Journal, and had given directions to the Editor thereon, as well as with regard to a number of suggestions for articles and notes which had been received from various correspondents. Applications from the Hanover Königliche Landwirtschafts-Gesellschaft and from the Institut National Agronomique at Paris, for free copies of the Journal, had been granted. The Committee recommended that the thanks of the Society be given to Mr. Walter Gilbey for his presentation to the library of a valuable collection of old agricultural works, and they reported the acquisition by purchase for the library of various modern agricultural books.

Earl CATHCART remarked that they were exceedingly indebted to Mr. Gilbey, on this as on many other occasions, for his kind generosity and thoughtfulness in presenting to the library some rare and valuable works on agriculture. They were also indebted to Miss Ormerod for a copy of her new Text Book on Agricultural Entomology, which would be very valuable for educational and scholastic purposes.

Chemical.

Mr. WARREN stated that the Report of the Woburn Sub-Committee had been received and adopted. Dr. Voelcker had reported his visits to the Experiments of the Norfolk Chamber of Agriculture and to those of the Essex Agricultural Society. A correspondence relative to the adulteration practised with rape cake used as manure had been read, and Dr. Voelcker had undertaken to refer to this subject in his annual report. A letter had been received from the North Wales University College, at Bangor, asking permission for Dr. Voelcker to give a course of chemical lectures at the College, in connection with the Board of Agriculture's scheme for the instruction of dairy teachers, but the Committee were of opinion that Dr. Voelcker's services could not be spared at the time named, and that therefore the request could not be acceded to.

Seed and Plant Diseases.

Mr. WHITEHEAD (Chairman) reported the conclusion of the potato experiments conducted during the past season, and stated that the Committee would bring up a report on the results of the experiments at the next meeting. A letter had been received from Miss Ormerod as to the inquiries which she had received and dealt with on behalf of the Society during the recess, and the thanks of the Council were ordered to be sent for the information given. The Committee had considered the arrangements to be made in consequence of Miss Ormerod's resignation of the post of Hon. Consulting Entomologist, and they recommended that a Consulting Naturalist to the Society be appointed. If this recommendation were approved, the Committee would bring up at their next meeting a further recommendation as to the conditions of the appointment.

Veterinary.

Sir JOHN THOROLD (Chairman) reported that the Committee had discussed carefully the recent outbreaks of pleuro-pneumonia, which had been traced to animals affected with the disease imported from Canada, and eventually they agreed to recommend that a letter, signed by the President, should be addressed to the President of the Board of Agriculture, representing the urgent necessity for the slaughter at the port of landing of all animals imported from Canada, and asking him to receive a deputation on the subject.

Copies had been received of the new Glanders or Farcy Order (No. 5,020); but the Committee regretted

to observe that, in consequence of the London County Council having declined to put in force the provisions of the Order authorising compensation for slaughter out of local rates, and the Board of Agriculture having necessarily revoked the Orders previously existing, there were at present no regulations providing for the slaughter of horses affected with glanders or farcy in the Metropolis.

The Committee had considered Lord Cathcart's resolution passed at the last Council meeting, on the subject of contagious foot-rot in sheep, and they recommended that the following letter, on the practice of the United States in regard to this disease, received by the Secretary from Dr. D. E. Salmon, be published with the proceedings of the Council for general information:—

Department of Agriculture,
Bureau of Animal Industry,
[COPY]. Washington, D.C.
October 15th, 1892.

My dear Sir,—I am in receipt of your letter of the 1st instant on the subject of contagious foot-rot of sheep, and also of the pamphlets on this subject which you were kind enough to send me.

In regard to your inquiry as to the regulations made by this Department for the suppression of this disease within the United States, I would say that up to the present no regulations have been established for this purpose. The disease is treated as a contagious disease with imported animals. These animals coming to the United States are destined mostly for breeding purposes, and go to farms in the various parts of the country. For this reason, animals found affected are held in quarantine until they are cured. We have, however, found very little of this trouble among imported animals. If I remember correctly, only one herd has been held on this account.

As our flock-owners have come to understand the communicable nature and treatment of this disease, its prevalence has been greatly reduced, and for the last few years we have scarcely heard of it in this country. On account of the mildness of the disease, and the comparative ease with which it may be treated and cured when taken in its early stages, and considering how seldom we hear of its existence, I should doubt the advisability, with us, of adopting the rigid measures which would be necessary for the suppression of a contagious disease.

I think the farmers of this and most other countries would be disposed to favour thorough measures for the control of such destructive maladies as tuberculosis and glanders before such comparatively unimportant affections as foot-rot are taken up.

With thanks for your enclosures,
I am very sincerely yours,
(Signed) D. E. SALMON
Chief of Bureau.

Mr. Ernest Clarke,
Secretary, Royal Agricultural Society of England.

Copies were laid upon the table of Professor Brown's pamphlet on "Contagious Foot-rot in Sheep," and of his leaflet on the same subject, issued during the recess, and the Secretary had reported that a large number of copies of the latter had been circulated.

The Committee recommended that prizes be offered at the Chester Meeting of 1893 for Horse-shoeing Competitions as follows:—

Class 1. Hunters	£6, £4, £3, £2, £1.
Class 2. Agricultural Horses ...	£6, £4, £3, £2, £1.

The Worshipful Company of Farriers had consented, as last year, to present (with the Freedom of their Guild) the two first prizes in each class, and to admit the prize-winners to the Register of the Company free of charge. The Committee recommended that facilities be afforded the Farriers' Company to utilise the services of the judges of horse-shoeing at Chester for an examination of the competitors not winning prizes, with the view to their admission, if successful, to the Register of Shoeing Smiths, under the Company's usual conditions. The suggestion made by the judges at Warwick that separate prizes should be offered for "doormen" or "nailers-on" had been further con-

sidered, but the Committee did not recommend its adoption.

The Committee gave notice that at their next meeting they would ask for a grant of 600*l.* for the coming year, of which 500*l.* to be given to the Royal Veterinary College, and 100*l.* to be reserved for general purposes.

The following report had been received from Professor Brown :—

PLEURO-PNEUMONIA. — During the past three months there have been nine fresh outbreaks of pleuro-pneumonia in Great Britain. Five of these were in London, one in Lancashire, two in Fife, and one in Forfar.

FOOT-AND-MOUTH-DISEASE.—Two outbreaks of this disease occurred in Leith during the month of August. The cattle affected in the first of these outbreaks were grazing in a field adjoining some sheds in which the disease existed about the middle of March. The three cattle in the field were slaughtered, but about ten days afterwards it was found that two of the cows in an adjoining shed had contracted the disease, but as most of the cows in this shed had the disease in March, the infection soon died out.

SWINE FEVER.—During the third quarter of the year there were 845 fresh outbreaks of swine fever reported in Great Britain; 3,199 pigs were attacked by it, 1,421 of the diseased pigs were killed, 1,389 died, 344 recovered, while 101 remained alive at the end of September.

ANTHRAX.—There were sixty-nine outbreaks of anthrax reported in Great Britain during the quarter ending September 24; 159 animals were attacked, fourteen diseased animals were killed, 129 died, and nine recovered.

Pleuro-pneumonia amongst Canadian Cattle.[1]

Sir JOHN THOROLD, in presenting the report, said that the Veterinary Committee had communicated informally with the President of the Board of Agriculture as to whether he could receive a deputation on the subject that afternoon (Wednesday), in order to urge upon the Board that the Act of 1878 should at once be put in force by rescinding the present regulations under which Canadian cattle are exempted from slaughter at the port of landing. The President of the Board had, however, stated that he would not be able to receive a deputation upon the day proposed, as he was not yet in possession of sufficient information upon the subject.

Mr. CHAPLIN asked whether he understood that the reply from the Board of Agriculture was that they were not possessed of sufficient information to enable them to receive the deputation.

Sir JOHN THOROLD said that the reply was that the Board were not possessed of sufficient information to enable them to receive the deputation that day; but they understood that the deputation was only postponed to another day.

Mr. CHAPLIN asked what information was before the Council as to the facts respecting the alleged importation of the disease.

Sir JOHN THOROLD replied that the Veterinary Committee had had a report from one of the veterinary officers of the Board of Agriculture that three animals in two different ships had been discovered to be affected with pleuro-pneumonia, and that the cargoes of these two ships, consisting of about 1,200 animals, had been dispersed throughout Scotland and the North of England. The board were at present engaged in tracing these animals, and in slaughtering them when found, and a large quantity of lungs were expected to be sent up yesterday (Tuesday) for inspection.

Mr. CHAPLIN asked whether it had been ascertained that the disease was contagious pleuro-pneumonia, and whether it had been contracted in this country.

Sir JOHN THOROLD replied that it was contagious pleuro-pneumonia, and that it certainly had not been contracted in this country.

Mr. DENT said he could quite understand that the Minister for

[1] See also page clxxviii for proceedings of the Deputation to the President of the Board of Agriculture.

Agriculture might want a little more time before receiving a deputation from that Society. It certainly appeared to him (Mr. Dent)—if what was stated yesterday were accurate, and if it was really the case that animals imported from Canada were affected with contagious pleuro-pneumonia—that it was absolutely essential that the importation of cattle should be stopped unless the animals were slaughtered at the port of disembarkation. (Cheers.) He was one of the Council who had questioned the utility or advisability of slaughtering in these cases; but he was bound to say that under the direction of his right hon. friend (Mr. Chaplin) the matter had been carried out very vigorously, with considerable expense, however, to the country, but with, he thought, a reasonable amount of success. If this persistent slaughtering were to be carried out with a view to stamp out the disease of pleuro-pneumonia by slaughtering the affected animals in the country, he thought that they could not admit any foreign animals unless they were slaughtered at the port of disembarkation, because it was very clear that it was not easy to say whether the disease existed or did not exist in a foreign country. They had had every reason hitherto to believe Canada to be free from the disease. Yet it was certain that two or three animals had been found affected with the disease, and they had no reason to believe that they had been in contact with any animals in Scotland. Therefore they were led to the belief that the Board of Agriculture ought to take the matter very seriously into consideration, and get an Act of Parliament passed to provide that all foreign animals should be slaughtered at the port of disembarkation. As long as it was thought necessary to carry out this system of slaughter for pleuro-pneumonia in this country, and to slaughter not only the animals affected with the disease, but the animals in contact or suspected of being in contact with diseased animals, it seemed a very hazardous thing that animals should be brought from foreign countries, over which they had no control, and as to which they could not say whether the disease existed there or not, and be allowed to be dispersed over the country. He hoped that it would be convenient to His Grace the President and to some of the members of the Council to see the President of the Board of Agriculture on the subject, because he was sure that the Council were most anxious not in any way to embarrass the present Government in the administration of what was an exceedingly difficult duty. It would be better that they should go and talk the matter over with the Minister of Agriculture with the information which they already had, and with the information in the possession of the Board.

The PRESIDENT said that the feeling of the Council appeared to be very strongly in favour of a deputation. Of course, if this disease were contagious pleuro-pneumonia, there clearly seemed to be an argument in favour of the slaughter of foreign cattle at the port of landing.

Mr. CHAPLIN said he was present at a meeting of the Central Chamber of Agriculture yesterday, and he was inclined to think that the arrangement suggested by Mr. Dent would be the best to adopt, viz., that the Council should concur in the proposal for deputations from the Chamber of Agriculture and the Royal Agricultural Society, which, although being separate and independent, could attend at the same time. He entirely agreed with what had fallen from Mr. Dent, that, if the facts were as stated, and as he (Mr. Chaplin) understood them—viz., that the disease had been ascertained to be contagious pleuro-pneumonia, that it had been found amongst Canadian cattle, and that it was clear that it had not been contracted since their arrival in this country—then it was of immense importance that the slaughter of all animals imported from Canada should be pressed upon the Board of Agriculture with all the force and with all the weight that that Council must necessarily command. Of course, he understood that it was a very delicate and difficult question; one that required most careful consideration on the part of the Board of Agriculture. That everybody would admit.

Everybody would also admit that, so far as they had already experienced, the action of the Board of Agriculture, in the hands of the new President of that Department, had been everything that the agricultural community could desire. But still there seemed to be some hesitation with regard to enforcing the law in this particular case. Unless he was entirely mistaken in his reading of the law, it was absolutely explicit on this point: if the fact were established that the diseased animals were from Canada, then in his judgment there was no alternative. The Board of Agriculture was bound to rescind the special exemption under which alone Canadian animals were brought into the interior of the country. At present the Act of Parliament laid down positively that foreign animals could only be landed at the Foreign Animals Wharf, and that they were not to leave that wharf alive. It was true that under certain circumstances foreign animals could be specially exempted from the operation of this clause; but these circumstances required that the Board of Agriculture should be satisfied that the laws in the country from which the animals came, and the sanitary conditions of the animals, were such as to give reasonable security against the importation of disease. He ventured to suggest that it was impossible for these conditions to be fulfilled, when they knew that at the present time diseased animals were coming from Canada. He thought that the views of that Council, which he believed were very widely shared by the agricultural community as a whole, should be submitted to the Board of Agriculture with as little delay as possible, and that they should exercise all the influence which they could legitimately command to secure the enforcement of the law. (Hear, hear.)

Sir MATTHEW RIDLEY said it appeared to him that they ought to ask for the deputation as soon as possible. Of course that must be in the hands of the Board of Agriculture, but at the same time they ought to remember that every twenty-four hours was of importance.

Sir NIGEL KINGSCOTE said that he had been about to rise to suggest the same thing. He thought that they ought to press urgently that the deputation should be received not later than Saturday.

The terms of the following letter to the President of the Board of Agriculture having been unanimously approved, it was signed by the President, and despatched immediately by hand:—

November 2nd, 1892.

Sir,—I have the honour to inform you that at a meeting of the Council of the Royal Agricultural Society of England, held to-day, it was unanimously resolved to request you to receive a deputation from this Society with reference to the recent occurrence of cases of contagious pleuro-pneumonia amongst cattle imported into Scotland from Canada, and to urge upon your Board to put at once into force the Act of 1878 by rescinding the special regulations under which Canadian cattle are at present exempted from slaughter at the port.

In view of the extreme importance and urgency of this matter, I am to express the hope of the Council that it may be possible for you to receive the deputation on some day not later than Saturday next.

I am, Sir,
Your obedient servant,
WESTMINSTER, President.

The President of the Board of Agriculture.[1]

Poisonous Qualities of the Yew.

Earl CATHCART, referring to the discussions which had recently taken place in *The Times* as to certain cases of poisoning of live stock, alleged to be due to the eating of yew, asked what was known as to the poisonous properties of the yew; whether the poison belonged to one sex only of the tree or to both sexes; also whether fatal results might not be attributed to the mechanical action

[1] [Subsequently to the rising of the Council, a telegram was received from the Secretary to the Board of Agriculture, stating that the President would receive the deputation at 3 P.M. on Friday, November 4, at 3, St. James's Square (see page clxxviii).]

of the spines at the ends of the leaves, when the latter were eaten by animals.

Mr. CARRUTHERS, the Society's Consulting Botanist, gave a detailed reply, in which he referred to the presence of taxine in the yew, and said that the question as to whether the poisonous qualities of the yew were restricted to one sex only of the plant could not be answered in the affirmative (see page 708).

Lord MORETON asked whether the yew tree appeared to be more poisonous at one part of the year than at another.

Mr. CARRUTHERS replied that he was not aware that that was so.

Stock Prizes.

Mr. SANDAY (Chairman) reported that the Committee had had under consideration the case of Lord Polwarth's cow "Truth," to which was awarded the first prize of 15*l.* in Class 45 at the Warwick Meeting, and the female championship of the Shorthorn classes. The Committee were of opinion that as the cow had not calved to either of the services given on the certificate of entry, she had not complied with the regulations of the Prize Sheet, and they therefore recommended that the animal be disqualified, and that the prizes in Class 45 be awarded as follows:—

CLASS 45.

No. 519, First Prize of 15*l.* to Lord Polwarth for "Wave of Loch Leven" (Second Prize).

No. 516, Second Prize of 10*l.* to C. W. Brierley for "Softlaw Rose" (Third Prize).

The Champion Prize of 25*l.* for the best female Shorthorn would therefore, in consequence of the disqualification of "Truth," fall to the Reserve Number for the championship, Her Majesty the Queen's "Rosemary."

Mr. J. S. Hodgson's cow "Pride of the Family 11th," No. 674 in Class 65, entered as in-calf, and awarded the Second Prize of 10*l.*, not having proved to be in-calf, the Committee recommended that she be disqualified, and the prize awarded to Mr. W. S. Forster for "Black Eyes" (Reserve Number).

In Class 146, for Large White Breeding Sows, all the animals to which prizes had been awarded (viz., Mr. Buss' "Elphick's Daisy," Mr. Gibson's "Miss Hough V.," and Mr. S. Spencer's "Holywell Bonny Girl") had become disqualified, and the Committee therefore recommended that the prizes be awarded as follows:—

CLASS 146.

No. 1,683, First Prize of 10*l.* to Denston Gibson for "Metchley Giantess" (Reserve Number).

No. 1,680, Second Prize of 5*l.* to J. Cashmore, jun., for "Worsley Baroness III." (H.C.).

No. 1,682, Third Prize of 3*l.* to Denston Gibson for "Jenny" (Commended).

The Second Prize animal, Mr. Sanders Spencer's "Holywell Rissole," No 1,703 in Class 150, having slipped her pigs at Warwick, was disqualified, and the Committee recommended that the second and third prizes in this class be awarded as follows:—

CLASS 150.

No. 1,706, Second Prize of 5*l.* to A. C. Twentyman for "Fairy" (Third Prize).

No. 1,702, Third Prize of 3*l.* to Sanders Spencer for "Holywell Curly Girl" (Commended).

A letter had been read from the agent to the Hon. D. P. Bouverie stating that in consequence of the wrong penning of "Coleshill Pride" and "Coleshill Sunbeam," the prize awarded to No. 1,715, "Coleshill Pride," had been credited to the wrong animal. The Committee having considered the circumstances of the case, recommended the disqualification of "Coleshill Pride," and the award of the prize to Lord Amherst's "Satin" (No. 1,714, the Reserve Number).

Letters of explanation had been read from exhibitors as to fines imposed for misconduct of their servants in charge of stock at Warwick; but the Committee were of opinion that as the fines were imposed after careful consideration by the Stewards at the Meeting, the payments must

be enforced. The Committee had arranged a preliminary prize-sheet for the Chester Meeting, which would be printed and sent out to all members of Council before the December meeting, when the Committee would bring up a formal motion for its adoption. The Committee had carefully considered Mr. Pell's motion as to the preparation of dead poultry, referred to them by the Council, and were of opinion that the time of year at which the show was held was not suitable for this kind of competition. They regretted, therefore, that they could not recommend any steps to be taken to carry out Mr. Pell's suggestion.

Various letters with reference to the prize-sheet for the Chester Meeting had been read, and instructions given thereon.

A resolution by the National Sheep Breeders' Association, asking for a class for ewe lambs to be added to the prize-list in all the sections which included a class for ram lambs, had been considered. The Committee were unable to recommend the inclusion of such classes in the Chester prize-sheet, but they proposed to bring the matter up for consideration when the time arrived for settling the prizes for the following year (1894).

An offer by the Shorthorn Society of two champion prizes of 20*l.* each for the best male and the best female animal in the Shorthorn classes at the Chester Meeting had been accepted with thanks.

On the motion of Mr. SANDAY, an offer from the Shire Horse Society, received since the meeting of the Committee, of two champion gold medals for the best Shire stallion and Shire mare or filly exhibited at the Chester Meeting, was also accepted with thanks.

Implement.

Mr. FRANKISH (Chairman) reported the recommendation of the Committee that a prize of 10*l.* be offered at the Chester Meeting for a sheep-shearing machine (other than the ordinary shears) worked by hand or by foot, in addition to the prize already settled for a sheep-shearing machine worked by power. The prize-sheet and regulations for the trial and exhibition of implements at the Chester Meeting had been settled, and the Committee recommended their adoption by the Council.

General Chester.

Mr. DENT (Chairman) reported that the Local Committee had submitted a list of prizes, which would be included in the draft prize-sheet, and be issued to members of Council before the next meeting. The Local Committee had undertaken to make the necessary arrangements for the regulation of cab fares from the railway stations to the showyard, and to nominate agents for the sale of dairy produce and for the letting of lodgings.

Showyard Works.

Mr. CLAY reported that the whole of the Society's plant had been transferred from Warwick to Chester, and had been stored under temporary sheds erected for the purpose; and that all the old materials had been sold, and had realised satisfactory prices. The Committee recommended the acceptance of the following tenders:—1. Messrs. Walter Hill and Co., for advertising the Chester Meeting. 2. Messrs. Shand, Mason, and Co., for the supply of fire-engines at Chester.

Correspondence had been received from the Agricultural Exhibitors' Association, enclosing copies of resolutions passed at a meeting of the exhibitors held during the Society's Meeting at Doncaster, with reference to obtaining from the railway companies the issue of return tickets at a single fare to exhibitors and their assistants, and a reasonable tonnage rate for carting to and from the show. The Committee recommended that the Council should co-operate as far as possible with the Agricultural Exhibitors' Association in endeavouring to obtain the concessions sought for, and that the Inspection Committee should be instructed in future to give this matter their attention when visiting the sites offered for the annual Country Meetings of the Society.

The Hon. CECIL PARKER, in reference to the paragraph recommending co-operation with the Agricultural Exhibitors' Association, thought the Society ought not to be pledged to take action against the railway companies.

Mr. CLAY explained that the cartage to and from the showyard at Warwick appeared to the exhibitors to be excessive. The amount charged was 5*s.* per ton each way. That was a charge of 10*s.* per ton for all descriptions of machinery and implements carted to and from the showyard. The Committee came to the conclusion that it might be made the duty of the Inspection Committee, at their visit of inspection, to ask the railway company what rates they intended to charge if the show were brought to the town inspected. Of course, if no arrangements were made beforehand, he supposed the companies felt themselves at liberty to charge what they thought fit. In order to obviate this, more particular instructions might be given to their Inspection Committee on that point. The Committee guarded themselves by saying "co-operation with the Exhibitors' Association as far as possible."

Mr. DENT thought the resolution went farther than Mr. Clay had indicated. There was a request made by this Association that exhibitors should have reduced fares for themselves, and not for carting of goods alone. It was a matter which would have to go before a meeting of the general managers of the various companies. The question now raised was a much larger one than merely of carting to and from the station.

Mr. SANDAY thought that it was not a question of antagonism to the railway companies. What the Exhibitors' Association asked was, that the Society should help them to obtain certain concessions which the Showyard Works Committee did not think unreasonable. It behoved the Society to look after the interests of the exhibitors at the shows as well as of members of the Society, and he saw no objection to the course proposed by the Committee.

After some further discussion, the report was agreed to.

Committee of Selection.

Earl CATHCART (Chairman) reported the recommendation of the Committee that the honorary membership of the Society should be conferred upon Professor Dr. Maercker, of the Versuchs-Station, Halle, Germany, in recognition of his distinguished services to European agriculture. The Committee had considered a memorandum prepared by the Secretary on the holding of the anniversary General Meeting of 1893, the date for which appointed by the Charter falls next year upon Whit Monday, and they recommended that a *pro formâ* meeting be held on that day in order to comply with the terms of the Charter, and that such meeting be immediately adjourned to the following Monday, May 29, 1893. They also recommended that the last Council meeting before the Chester Meeting be held on the following Wednesday, May 31, instead of Wednesday, June 7.

Election of Honorary Member.

Lord CATHCART, in moving that Professor Maercker be elected an Honorary Member of the Society, and that the Seal of the Society be affixed to his diploma of honorary membership, said that the Professor was one of the most distinguished of living chemists, and he had no hesitation in proposing him for the honorary membership, believing that he would confer upon the Society as much honour as the Society conferred upon him.

Mr. WHITEHEAD seconded the motion, which was adopted unanimously.

Education.

Lord MORETON (Chairman) reported that the question of the publishing price of the forthcoming fourth edition of the Society's Text-book on Agriculture had been considered, and the Committee recommended that the price of the new edition be fixed at 3*s.* 6*d.*, in consideration of the extra cost incurred for the production of entirely new illustrations, and the increased number of pages. The new edition would contain thirty-six more pages than the others, and would include 256 original illustrations from

wood engravings, as compared with 200 process and other blocks in the previous editions. The engravings of live stock were from the life, and an endeavour had been made to present the relative sizes of the animals in each of the four sections of horses, cattle, sheep, and pigs, though it had of course not been possible to show the horses and cattle on so large a scale as the sheep and pigs. The author had carefully revised the text, and had made additions to various parts of the work, whilst at the same time he had had in view the necessity of keeping the volume within moderate dimensions.

The Secretary had reported that forty-three candidates from thirteen schools had entered for the Society's forthcoming junior examinations, to be held on the 8th and 9th instant, and that the necessary arrangements for the examinations were in progress. The ten successful candidates at last year's examinations having duly complied with Regulation 2, the Committee recommended the payment of the scholarships and the despatch of the certificates forthwith. The date of the next Senior Examination had been fixed for May 9 to 13, 1893.

A communication had been received from the Charity Commissioners, forwarding copies of a draft scheme for the administration, under the Endowed Schools Acts, of Cowley's Charity at Donnington, in Lincolnshire, and inquiring whether, in the event of the scheme receiving the approval of Her Majesty in Council, the Council of the Royal Agricultural Society would be prepared to appoint a Governor, as proposed under Clause 6 of the draft. The Committee recommended that an affirmative answer be sent to the Commissioners, and reported that they would be prepared to nominate a representative when the scheme had been finally approved.

The Committee gave notice that at their next meeting they would move for the renewal of their annual grant of 500*l.* for the year 1893.

Agricultural Instruction at Cambridge University.

The Committee desired to call the attention of the Council to the following Scheme and Statement prepared by a Sub-Committee of Delegates of certain County Councils, meeting in London, for promoting Agricultural Education at Cambridge, which had been submitted by Mr. Pell:—

(*a*) *Scheme.*

Cambridge, September 17, 1892.

The object in view is the establishment and maintenance of scientific instruction in subjects bearing upon agriculture at Cambridge.

The instruction to be in the following subjects:—

Agriculture. Chemistry — Elementary and Agricultural. Botany—Elementary and Agricultural. Physiology. Geology. Economic Entomology. Book-keeping. Mensuration. Surveying. Agricultural Engineering.

Opportunities will be offered for the study of Agricultural Law, and may also be provided for the teaching of Veterinary Science.

In aid of the above object, certain professors and teachers in the University are willing to admit to their lectures, and to practical instruction in their laboratories, students, not members of the University, under the following conditions:—

That the students are not under seventeen years of age. That the students shall give satisfactory evidence that they have received a sufficient previous education to enable them to take advantage of the proposed instruction.

That from outside sources an annual contribution of 550*l.* be provided, for two years at least, towards the stipends of the teachers, as follows:—Of Agriculture and Chemistry, 300*l.*; Botany, 100*l.*; Economic Entomology, 50*l.*; Physiology, 50*l.*; Agricultural Engineering, 50*l.*

The present contemplated sources of the sums to be moneys at the disposal of the County Councils for educational purposes.

For further development, assistance is looked for from the Board of Agriculture, and to action on the part of governing bodies of endowed schools.

The instruction to extend over two years (each year to be divided into three terms of eight weeks), in the following course:—

MICHAELMAS TERM.—Junior Class—Mondays, Wednesdays, and Fridays: Chemistry Elementary, Lecture and Practical. Tuesdays, Thursdays, and Saturdays: Botany Elementary, Lecture and Practical. Afternoons: Physics. Senior Class—Mondays and Wednesdays: Botany; Afternoons: Vegetable Pests. Fridays: Botany; Afternoons, Book-keeping. Tuesdays: Agricultural Chemistry, Lecture and Practical. Thursdays: Agriculture, Field; Agricultural Chemistry, Practical. Saturdays: Agriculture, Lecture; Agricultural Chemistry, Practical.

LENT TERM.—Junior Class—Chemistry Elementary, Lecture and Practical. Tuesdays, Thursdays, and Saturdays: Botany Elementary, Lecture and Practical, with Mensuration in afternoons. Senior Class—Mondays and Wednesdays: Physiology; Afternoons: Economic Entomology. Fridays: Physiology; Afternoons: Book-keep-

ing. Tuesdays: Agricultural Chemistry, Lecture and Practical. Thursdays: Agriculture, Field, and Agricultural Chemistry, Practical. Saturdays: Agriculture, Lecture; and Agricultural Chemistry, Practical.

EASTER TERM.—Junior Class—Mondays, Wednesdays, and Fridays: Chemistry Elementary Quantitative, with Surveying in afternoons. Tuesdays, Thursdays, and Saturdays: Agricultural Botany, Geology. Senior Class—Mondays, Wednesdays, and Fridays: Engineering, with Book-keeping afternoons of Fridays. Tuesdays: Agricultural Chemistry, Lecture and Practical. Thursdays: Agriculture Field, and Agricultural Chemistry, Practical. Saturdays: Agriculture Lecture, and Agricultural Chemistry, Practical. Tuesdays, Thursdays, and Saturdays: Geology.

It is estimated that any student for the whole course will have to pay, the first year 19*l.* 19*s.*, and the second 18*l.* 18*s.*, in fees; and that for board and lodging the cost will be from 6*l.* to 8*l.* a term; so that the necessary expense will be from 38*l.* to 44*l.* per annum for the whole course.

It is suggested that in addition to the contribution of 550*l.*, scholarships might be offered by County Councils to assist students.

(*b*) *Statement.*

Those who have prepared this scheme have thought it well to add that the course of instruction will be announced in the usual list of University lectures, and will be open to members of the University, but it will also be advertised in the newspapers as open to non-members of the University, under certain conditions; and they think that if success rewards their efforts, the University may soon afford its support.

This is the way other new subjects have been introduced in the past, and which have afterwards been sanctioned by the University. For instance, engineering, the University Extension system of lectures and examinations, the examination and tuition for the public health diploma, &c. The County of Cambridge Council will probably help in making the start, which may be expected to influence neighbouring County Councils to do the same.

It is known that some gentlemen in the neighbourhood of Cambridge will give the students the privilege of walking over and inspecting their farms, and, it is hoped, may be induced to try some experiments for their own and the students' benefit, and application will be made to the Royal Agricultural Society of England for permission to examine and study their experiments conducted at the farm at Woburn.

Finally, it would not be desirable that the students should be left without some general supervision and control, securing good conduct and regular attendance at the lectures.

ALBERT PELL, Chairman.

Mr. PELL said he might perhaps be permitted to say a word or two in explanation of the scheme referred to in the report. In 1890, when the then President of the Board of Agriculture (Mr. Chaplin) addressed a letter to the Chancellor of Cambridge University (the late Duke of Devonshire), suggesting that the University should proceed to afford opportunities for teachers to master the scientific subjects bearing upon agriculture, the question was referred to a syndicate of the Senate, consisting of many eminent residents, and including the Duke of Devonshire, Lord Walsingham, Mr. Dent, and himself. The syndicate took more than a year to consider the matter, and eventually agreed upon a plan. Unfortunately, however, the Senate rejected their proposal by a small majority in a very large house. Those who were concerned in the matter did not, however, let it drop, and since then several counties, ten in number, had sent delegates to London to consider the question of the provision of instruction in agriculture at the Cambridge University. The matter had been referred to a Sub-Committee (of which he had the honour to be Chairman), who, acting in concert with the teaching bodies at the University of Cambridge, had prepared the scheme which appeared in the report. It was estimated that from outside sources an annual contribution of 550*l.* would be required, but the County Council of Cambridge alone had voted 400*l.*, and only 150*l.* more was required. They did not ask for any money whatever from the Royal Agricultural Society, but he was glad that the scheme would appear in the proceedings, because landowners generally, as well as occupiers, would have the opportunity of seeing what was being done, and the possibility and probability of their being able to obtain for their sons first-rate instruction in Agricultural Science at the University. The University had opened this course of instruction to members of the University with the intention of their proceeding to a degree in Agriculture. To his mind that was a very important step in the direction of agricultural education, and one of which he felt sure the sons of many agrarian proprietors who might be studying at Cambridge would like to take advantage. (Hear, hear.)

Dairy.

The Hon. C. T. PARKER (Chairman) reported that the Committee had

agreed upon a draft schedule of prizes for dairy produce, butter-making competitions, &c., which they had referred to the Stock Prizes Committee for inclusion in the draft prize-sheet for the Chester Meeting. They had considered and generally approved of the proposals of the Local Committee in regard to classes for dairy cattle, which they referred to the Stock Prizes Committee. The scheme of the Board of Agriculture for instruction to dairy teachers at the North Wales University College, Bangor, had been received and laid upon the table. The Committee gave notice that at their next meeting they would move for the renewal of their annual grant of 100*l.* for 1893.

Docking of Foals' Tails.

The Duke of WESTMINSTER, referring to the present fashion of docking the tails of foals, and then turning them out to grass without the means of keeping off flies, moved:—

> That in future no foals with docked tails should be entered for the Society's Country Meetings.

His Grace said he made his motion entirely upon the ground of cruelty to the animal, as he was under the impression that the tail was given to an animal for certain purposes, not only as a balance to the head, but for the practical purpose of keeping off the flies when turned out to grass. It was absolute cruelty, when flies were very much about, to turn out animals unprovided with the means of keeping them off. He had been told of cases where land had been let at lower rates in consideration of the animals having had their tails docked, and consequently consuming less grass.

The SECRETARY read the following letter, which had been addressed to him by Mr. James Hornsby, who was unable to be present:—

Stapleford Park,
[COPY.] Melton Mowbray,
October 29th, 1892.

Dear Mr. Clarke,—

I regret I cannot attend the Council Meeting of the R.A.S.E., but feel the importance of docking horses so great to the breeder that I shall be obliged if you will state from me that, after having had a good deal of experience in breeding horses, if I was not permitted to dock them I consider I should reduce the selling price by from 30*l.* to 100*l.* each. I have myself bought cobs with the long tails at about 50*l.*, and after docking them they have been worth 100*l.*, and it has so much improved their appearance that the breeder has scarcely known them. In these fearfully depressed times, I feel the R.A.S.E. ought not to do anything to stop the trade of breeding, but do all in its power to assist the agriculturists.

It is stated that if the horses are docked they cannot be sold to the Government. This, in my opinion, is no reason at all, because the breeder cannot afford to breed horses for the Government at the prices they now offer—35*l.* for troopers' horses to 48*l.* for officers' horses. But I think the R.A.S.E. ought, if possible, to assist the breeders in getting the Government to take horses that are docked after they have had an opportunity of putting them in the best form to sell to higher and better customers; and I feel if the resolution is passed to stop the docking of foals it will be one step against docking, which step I think the R.A.S.E. ought not to take.

I am, faithfully yours,
(Signed) JAMES HORNSBY.

Mr. WALTER GILBEY was very sorry to oppose the noble President. He wished His Grace had merely proposed a vote of disapproval, so as to get an opinion circulated throughout the country, as at the present time no one had had notice of the change proposed. The resolution would not be of serious consequence. There were many acts of cruelty to animals other than foals, and if these were docked at all, it was generally at an age when there was least suffering. They might consider the question of sheep, of lambs' tails, the cutting of combs off cocks, and many other inflictions now practised.

The Duke of WESTMINSTER pointed out that Mr. Gilbey's argument did not quite apply, as it was a question of the protection of the animals from flies.

Earl CATHCART was very sorry not to be able to support the noble Duke in the chair in this matter; but he had spent the best years of his life in Yorkshire—in fact, ever since he had been twenty-one years of age; he felt bound, therefore, to express the views of those he represented in that county, who were in favour of the accustomed practice of docking horses. He might remind them of the late Mr. Wakefield's famous show hunter "The Banker." This animal was originally purchased from Mr. Wakefield by a dealer, who asked, as a matter of convenience, that the horse might remain for a few days in the vendor's stable. Meanwhile, the dealer had the colt docked. After this operation, Mr. Wakefield, going into the stable, was surprised to see an apparently strange horse there, and asked whose it was, not recognising the animal he had just sold. The operation so improved the appearance of the horse, that Mr. Wakefield immediately repurchased it at a very considerably enhanced price, and the repurchase proved an excellent investment. Upon his (Lord Cathcart's) visit to the French *haras* some years ago, he noticed that the tails of the "Poste" and "Diligence" horses were twisted up and laced in a sheath with great elaboration. Horses as leaders could not run in harness with their long tails. They might cut the hair short, but they must take some of the stump off if they wished to make an effectual job of it. In a waggon, for instance, it was a very disagreeable, inconvenient thing to have the long-tailed leaders flapping their long, dirty tails in the wheelers' faces. Therefore, on many grounds, he held it was not desirable, especially at the present moment, to make radical changes in a convenient custom, which had so long prevailed.

Sir NIGEL KINGSCOTE supported His Grace with the greatest cordiality. He thought that they should say at once that foals ought not to be docked; or, at any rate, that they should not give them a single minute longer than the year 1894. He thought that this fashion of docking the tails of foals should not receive the encouragement of the Royal Agricultural Society. He went not only on the ground of what he would call this senseless fashion, but also on the ground of its being actually cruel. Everybody who chose to go through Yorkshire and Norfolk must notice the poor brood mares feeding under the little shade which they could get, with no possible means of swishing the flies off. A great Society should not encourage so senseless a thing as the docking of horses' tails; and, any way, they should not encourage the docking of foals. The arguments of those who said that it was less cruelty to them when foals, did not seem to improve the case at all. If they wanted to have the horses docked, they might dock them at any time without danger. Mr. Hornsby made light of the price for Government horses. He (Sir Nigel) had lost money himself by horses which officers would not buy because they had docked tails.

Mr. HAMOND said that in Norfolk, if horses were not docked they would only fetch about 35*l.* as a "soldier," but if docked they would probably be shown as stallions at the Royal Agricultural Society's shows, and the prices would be from 150*l.* to 200*l.* apiece. If not docked, they would not fetch more than a quarter of the price.

H.R.H. Prince CHRISTIAN raised the question as to when this fashion of docking the tails of horses had been reintroduced. It seemed to him to have become general again only during the last few years. He had now been more than twenty-five years in this country, and he did not remember seeing docked horses except during the last four or five years. In his view, the docking of horses' tails spoilt their appearance.

Mr. PELL referred to a still more cruel practice than docking, that known as "nicking," which caused a good deal of suffering, and which used to be practised years ago. There was undoubted suffering in this practice of docking. He could not help thinking that the Society should do everything to condemn it. He thought the suggestion that notice should be given that docking would not be permitted another year was a fair one.

Mr. CHANDOS-POLE-GELL said that in his county of Derbyshire a large number of cart horses were bred. They were in the habit of docking

them when a few days old, and were all pleased and satisfied with the result. In his own experience, he had found it answer well. He did not think that the foals suffered to any extent, and he did not notice the suffering referred to by Sir Nigel Kingscote. He thought the farmers of England would object to their not being allowed to dock their horses.

Mr. MARTIN had been a farmer for a good many years, and he had not suffered in any way from the foals being docked. If horses were to be docked at all, it was less cruel for them to be docked when young foals. He did not think they ought, as a body, to interfere too much with the trade of the country, or throw any obstacle in the way of agriculturists.

Mr. GARRETT TAYLOR said that if farmers did not dock horses, dealers or other people would. Certainly ninety-nine out of every 100 horses were docked.

Mr. CHRISTOPHER WILSON hoped that the Society would not force such a regulation upon the breeders of Hackneys, who, if they were polled, would all be in favour of the practice. He thought long, flying tails with Hackneys would be a great disfigurement to them, and would be most dangerous in driving horses. He happened to have seen a good many accidents with ponies with long tails driven by ladies. The long tails got over the reins, and the ponies ran away with the vehicles. During the last few months he had sold twenty ponies, at an average of 163 guineas each. He had left one undocked for his daughter to ride, and he expected that this would remain upon his hands.

The PRESIDENT then put the motion, which was lost by nine votes to sixteen.

Country Meeting of 1894.

Further letters were read from the Local Authorities of St. Albans, and from the Hertfordshire County Council, as to the invitation to the Society to hold its Country Meeting of 1894 in that city. It was decided that the Committee of Inspection to view the sites and other accommodation offered, both at Cambridge and St. Albans, should be appointed at the next Council meeting in December, and be requested to bring up their report at the meeting in February 1893, when a decision would be arrived at.

Bimetallism as Affecting Agriculture.

The SECRETARY read a letter from the Société des Agriculteurs de France, stating that a special committee of that body had been appointed to study the question of bimetallism as it affected agricultural interests, and again asking the Society's co-operation in this inquiry.

In reply to a question by Mr. CHAPLIN, Earl CATHCART stated that the Société des Agriculteurs de France, of which he was an Honorary Member, was formed very much on the lines of the Royal Agricultural Society, and was an association of over 10,000 members.

Mr. CHAPLIN expressed the hope that the Council would agree to send a sympathetic answer to the eminent agriculturists in France who were considering this question. Having been a member of the Gold and Silver Commission, he had given a good deal of serious attention to this matter, which was one of extreme importance to the agricultural community. They should endeavour to return to that system of bimetallism which existed previously to 1873, as the present depression in every kind of industry throughout the world appeared to date from the change in the European monetary system which began at that date.

Miscellaneous.

Further letters were read from Mr. Frank Proctor on the subject of steam digging, and it was decided to reply that the Council had nothing to add to their previous communications. Various other letters and documents were read and ordered to be laid upon the table.

Date of next Meeting.

The Council then adjourned until Wednesday, December 7, at noon.

Proceedings at Deputation to the President of the Board of Agriculture,

ON THE SUBJECT OF THE OUTBREAK OF PLEURO-PNEUMONIA AMONGST CATTLE IMPORTED FROM CANADA,

FRIDAY, NOVEMBER 4, 1892.

THE President of the Board of Agriculture (the Right Hon. Herbert Gardner, M.P.) received on Friday, November 4, 1892, at 3, St. James's Square, S.W., deputations from the Royal Agricultural Society of England, the Central and Associated Chambers of Agriculture, the Smithfield Club, and the Shorthorn Society of Great Britain and Ireland, to urge the Board to put at once into force the Contagious Diseases (Animals) Act of 1878, by rescinding the special regulations under which Canadian cattle were exempted from slaughter at the port of landing.

Owing to the shortness of the notice as to the time appointed for the reception of the deputations, many members of Council of the various bodies represented were prevented from attending, and communications expressing regret at inability to be present were received from the following:—

Royal Agricultural Society of England.—H.R.H. Prince Christian of Schleswig-Holstein, K.G., Right Hon. Henry Chaplin, M.P., Mr. G. Mander Allender, Mr. J. Bowen-Jones, Mr. J. Dent Dent, Mr. Charles Howard, Mr. Joseph Martin, Mr. James Rawlence, Mr. W. T. Scarth, Mr. Henry Smith, Mr. Martin J. Sutton, Mr. Garrett Taylor.

Central and Associated Chambers of Agriculture.—Right Hon. James Lowther, M.P. (Chairman), Mr. W. Stratton (Chairman of Cattle Diseases Committee), Mr. Carrington Smith, Mr. H. Marriage, Mr. T. Duckham.

Shorthorn Society—Mr. Philo Mills (Vice-President).

Smithfield Club.—Mr. James Hempson, Mr. Latham (Stewards).

The members of the various deputations present were as follows:—

Royal Agricultural Society of England.—The Duke of Westminster, K.G. (President), Sir John Thorold, Bart. (Chairman of the Veterinary Committee), Mr. Walter Gilbey (Vice-President), Mr. C. S. Mainwaring and Mr. J. P. Terry (Members of Council), Mr. Ernest Clarke (Secretary).

Central and Associated Chambers of Agriculture.—Mr. Clare Sewell Read, Mr. W. W. Glenny, and Mr. Barfoot-Saunt (Members of Council), Mr. R. Henry Rew (Secretary).

Smithfield Club.—Sir John Swinburne, Bart. (President), Mr. E. J. Powell (Secretary).

Shorthorn Society of Great Britain and Ireland.—Mr. S. P. Foster (Member of Council), Mr. E. J. Powell (Secretary).

The President of the Board of Agriculture was attended by Mr. T. H. Elliott (Secretary of the Board), Mr. Richard Dawson (Assistant Secretary), Mr. Alexander Cope (Chief Inspector of the Veterinary Department), and Mr. A. W. Anstruther (Private Secretary).

The Duke of WESTMINSTER introduced the deputations, and said: Having the honour of being President of the Royal Agricultural Society of England for this year, I appear, with a number of my colleagues on the Council, to represent that Society, and I have also to introduce to you deputations

from the Central and Associated Chambers of Agriculture, from the Shorthorn Society, and from the Smithfield Club, who represent the great mass of the agricultural interests of this country. You will not have been surprised that we have requested you to see us to-day, on account of the general and well-founded alarm that has been created by the importation of Canadian cattle, by their dispersal in Scotland, and by the outbreak, soon after landing, of contagious pleuro-pneumonia in those animals so imported—some time at the end of September and the beginning of October last. In this case, as it will be seen, inspection—and I call your special attention to this fact—is perfectly useless. I understand that it is admitted by the veterinary profession that the disease may be latent in the bodies of these animals for uncertain times—whether longer or shorter—and in some cases for a very long time before the disease is recognised; and, therefore, it is contended that inspection in cases of pleuro-pneumonia is of no avail.

The 5th Schedule of the Contagious Diseases (Animals) Act of 1878 lays down distinctly that foreign animals are only to be landed at a special wharf at every port, and that "they are not to be moved alive out of the wharf." The only exception to this otherwise universal rule is in the case of any foreign country, in which the Board of Agriculture are satisfied "that the laws thereof relating to the importation and exportation of animals, and to the prevention of the introduction or spreading of disease, and the general sanitary condition of animals therein, are such as to afford reasonable security against the importation therefrom of diseased animals." It is very evident from the action of your Board that the Board are not satisfied that this condition of things exists with regard to Canadian cattle, for you have, as we understand, given orders under the Act of 1890, not only for the slaughter of the animals landed at Dundee, but also of the animals which came at all into contact with the diseased stock. We ask you, then, to do that which we believe you are very ready to do, for the reasons stated—viz., to put into force the powers conferred upon you by the Act of 1878, and to rescind the special regulations under which, at present, Canadian cattle are exempted from slaughter at the port.

May I add one word with regard to the operations of the Board of late, as I think the country in general cannot be too grateful for the active zeal and attention given to this question by the Board of Agriculture? It has saved the country from an immensity of disease. It is very remarkable how rapidly the disease has been diminished by the action of your Board, and we cannot believe that the zeal and energy of the Board will be relaxed, or that there will be any break at this time in the continuity of action of the Board of Agriculture. It forms a very remarkable contrast to the laxity of previous years, especially when the cattle plague invaded our country, and which, owing to the laxity of our then authorities, obtained such a strong hold upon the country. In my own county of Cheshire we lost 80,000 head of cattle from that disease alone, which shows what serious results arise from laxity in precautionary measures.

Sir JOHN THOROLD said he had the honour of representing the Veterinary Committee of the Royal Agricultural Society. As far as he was concerned, he had nothing to add to the remarks of His Grace, that they, as representing the Society, had viewed with great satisfaction the action of the Board with regard to pleuro-pneumonia, and they feared that unless that action was now continued, the losses which the farmers had sustained, and the restrictions which they had suffered, would have been suffered in vain; and he hoped the President would immediately put in force the Act forbidding the importation of animals except for slaughter at the port of landing.

Mr. CLARE SEWELL READ attended in the absence of his friend Mr. William Stratton, who was Chairman of the Cattle Diseases Committee of the Central Chamber, to represent the Central Chamber of Agriculture. He might also say, in passing, that he was Chairman of the

Farmers' Club, that he was Chairman of the Norfolk Chamber of Agriculture this year, and that he was, further, Chairman of the Cattle Diseases Committee of the County of Norfolk. But he would rather represent himself as a sorrowful—though he hoped an honest—grazier. He had in the last few winters grazed over 200 of these Canadian stores; and he was bound to say that, with one exception—in which the unfortunate animal swallowed a bit of wire—the whole of these cattle had been remarkably healthy, and that, therefore, they fed very well on the whole, and paid as well as cattle did pay in these days of distress in agriculture.

He could not at first bring himself to believe in the truth of the report that contagious pleuro-pneumonia had broken out among a cargo of these cattle from Canada, but from the action taken by the Board there was not the slightest doubt that this was the case. Therefore they attended to ask the Board to schedule Canada in the same way as the United States was scheduled at the present moment. He would further remark that it was very much to the detriment of the winter graziers in the county of Norfolk to stop the importation of these Canadian stores, whilst at the same time he recognised what the Board of Agriculture had done for them in almost entirely exterminating pleuro-pneumonia from their midst. This was the third year in which the Department had taken over this disease, from which the country had suffered for almost forty years. They were very grateful to the Board for what they had done for them. Therefore, they thought and believed that the same action would be taken to protect them against the importation of diseased animals from abroad.

Sir JOHN SWINBURNE said that he had the honour on that occasion to represent the Smithfield Club, of which he was President. He had himself been a breeder of cattle during the last quarter of a century. This matter of pleuro-pneumonia, therefore, appealed to him personally, and also to him in his official capacity, with great force. 300,000*l.* had been spent in a few years in stamping out this most insidious disease, which was most difficult to detect. They did not ask for protection for their trade, but they did ask for protection from disease.

Mr. S. P. FOSTER apologised for the absence of the Vice-President of the Shorthorn Society, who was not able to attend that day on account of the short notice. As he (Mr. Gardner) was aware, the breeders of Shorthorns represented both in value and numbers a very large proportion of the cattle in England; and he might say that in the county of Cumberland it cost the ratepayers 8,000*l.* in one year to stamp out pleuro-pneumonia only two years ago, and he could point to two valuable herds of Shorthorns which had had imported into their herds one, or at the most two, cases of pleuro-pneumonia. One was a very valuable herd, only three miles from him (Mr. Foster) in Cumberland. The whole of this herd was slaughtered because of one cow which had been subjected to pleuro-pneumonia. It was only fair that, if their cattle were to be put down, imported cattle should be placed in the same category.

Mr. WALTER GILBEY said that Mr. Gardner had heard the remarks of those gentlemen who represented societies, and Sir John Thorold had ably represented what had been stated at the Council meeting of the Royal Agricultural Society. It was his interest in the county of Essex that brought him there. He was a tenant-farmer, living amongst tenant-farmers. He could support all that they had stated, and he asked him (Mr. Gardner) to carry out their wishes. The tenant-farmers in a grazing district like Essex could never buy store cattle so cheaply as at the present time, and this should be a great inducement to further restrictions being put upon cattle coming from Canada. He was at a farmhouse the other day where thirty head of Hereford cattle had been bought at 4*l.* 10*s.* a head. With so convincing a proof, it ought to satisfy the world that putting on restrictions would not increase the value of cattle in this country. He respectfully asked the President to take the matter into consideration, and do what they wished, if he should see it in his power.

The PRESIDENT of the BOARD OF AGRICULTURE in reply said: My Lord Duke and Gentlemen,—I may say at once that I recognise to the full the importance of the deputation which has done me the honour of being present this afternoon. I recognise the composition of the deputation which is here to-day, containing, as it does, so many eminent agriculturists, and I recognise that the opinion of the various influential societies represented must carry great weight with any Government that may happen to be in office. With regard to the present matter, I am sure everyone will agree that it is a source of deep regret that circumstances should have arisen which should have obliged us even to consider the necessity of imposing restrictions on the trade not only of our fellow-subjects across the Atlantic, but also on those on this side who have found the importation of store stock both advantageous and profitable.

How important the Canadian trade has become in many parts of the country is shown by the fact that the number of cattle imported has risen from 65,125 in 1887 to 107,524 in 1891, and the value of these imports has increased from 1,135,000*l.* to 1,771,000*l.* It is true, of course, that the last-mentioned figure does not amount to 2 per cent. of the aggregate meat supply of this country, and it is also true that the restrictions on Canadian animals—which you, gentlemen, have come here this afternoon to advocate—would not be prohibitive of the importation of fat stock for slaughter at the ports. But although our imports of Canadian stores form a small item in our cattle trade, they form one of the largest items of the imports from Canada. However, there would still be nothing to prevent our Canadian friends from feeding their stores at home, and sending them over as fat stock, which some advocate as the best course for the Canadian farmers to follow in their own interests. Yet, on the other hand, I am bound to say that it will be impossible for them to obtain, under the requirements of slaughter at the ports, such good prices as they would otherwise have received. And we must remember that the losses to graziers through restriction of the Canadian trade would not be equally distributed all over the country. At the same time, I cannot say that that fact affords a conclusive argument against the restrictions which you advocate, because much of the work devolving upon the Board of Agriculture under the Contagious Diseases Act consists of the balancing of individual and local disadvantages against the interests of the agriculturists of Great Britain as a whole. I mention these points without the slightest intention of minimising the action of the Board of Agriculture with regard to the disease. The safety of the flocks and herds of the country is as dear to us as to our predecessors, and we will spare no means of giving as full a measure of security as it is in our power to do.

It is almost unnecessary to remind you, who are so well versed in agriculture, of the enormous benefits that have resulted from the working of the Contagious Diseases (Animals) Act. I have referred on a previous occasion to what has been done with regard to foot-and-mouth disease, and perhaps a few figures as to pleuro-pneumonia may be acceptable to the deputation. In 1887, there were 618 outbreaks; in 1888, 513; in 1889, 474; in 1890, 295. You see the gradual diminution of the figures, and last year, in 1891, there were only sixty outbreaks. And whereas, in the month of September 1890, there were forty-six outbreaks, in September 1891 there were only eleven, and in September 1892 only two. These results are startling. The success of our efforts to protect our herds and flocks must be admitted as striking and most satisfactory. Everyone, in my opinion, even in the localities which have temporarily suffered from the restrictions put upon them, will admit that the sacrifices which have been made will be thrown away if the disease is again introduced by reason of importation from abroad.

Therefore it is that, after the most elaborate and personal investigation of the facts, and after a most lengthy consideration of the matter in all its bearings, we have come to the conclusion that these facts are inconsistent with the "reasonable security" contemplated by the law; and that

we have absolutely no alternative but to withdraw, however reluctantly, that special exemption from slaughter at the ports of Canadian cattle which Canada has enjoyed so long. (Hear, hear.) An Order to that effect has already been signed, though with the deepest regret that the necessity should have arisen. I trust the efforts of the Canadian Government, which appears to be most patriotically and efficiently administered, will allow us to resume our trade with the Colonies once again under the conditions so long enjoyed by our fellow countrymen on both sides of the Atlantic. But at the present time and under the present circumstances our duty is clear, and I regret to say that no other course is open to us under the law than to impose slaughter at the ports. (Hear, hear.)

I hope it is not necessary for me to assure the deputation that this matter has been anxiously engaging the attention of the Board and its principal officers since the first rumours on the subject reached our ears. On the very day, September 17, when we ascertained that the disease was of Canadian origin, we took all the necessary steps to trace the 1,211 head of cattle which had arrived from Canada, and to place the animals and the animals in contact under restrictions. On the 18th, seventy-nine owners scattered over the country were served with notices, and 1,143 out of the total of 1,211 head of cattle were traced. On October 6 the information before us satisfied us that whatever might be our obligations under the law, we were bound, in fairness to those whose cattle were under restrictions, to relieve them from further inconvenience and loss, and we accordingly gave orders for the slaughter of the whole of the Canadian cattle. We made arrangements for systematic inspection of the lungs of the animals.

In the meantime, the most urgent representations reached us from all quarters. We were assured by some correspondents that contagious pleuro-pneumonia had been absolutely unknown in Canada, that the law in the Colony made the introduction of disease absolutely impossible, that if any disease was found in the animals it was brought on simply by exposure on the voyage, and that the disease was not pleuro-pneumonia at all. It was further suggested that there had been some error of identification with regard to the animals; and again, that if the animals really had pleuro-pneumonia, it had been contracted in this country. We felt it our bounden duty to thoroughly and exhaustively sift all the evidence brought before us, in justice to ourselves and in justice to the great and important interests concerned on both sides of the Atlantic. It was obviously impossible for the Board of Agriculture to recall the privilege which Canada had enjoyed for many years without the most complete and exhaustive consideration. I felt it my duty to take the opinion of my colleagues in the Government, and also to ascertain from the highest authority our legal position in this country. I am anxious to assure the deputation that no unnecessary time has been lost in this matter, and to assure those whose interests are affected that before arriving at this conclusion the most careful and deliberate consideration in our power was given to the matter. We regret the decision which has been forced upon us, but we felt that the adoption of measures for the security of our flocks and herds was a paramount duty which we had to fulfil. (Hear, hear.)

The Duke of WESTMINSTER said that the decision of the Board would give the greatest satisfaction throughout the whole of the country, and he desired in the name of the agricultural community at large, as well as in the name of the Societies represented that day, to thank the President for the action he had taken, and for his courteous reception in receiving the deputations, and in giving them so full an explanation of the operations of his Department.

The deputations then withdrew.

Proceedings of the Council.

WEDNESDAY, DECEMBER 7, 1892,

THE DUKE OF WESTMINSTER, K.G. (PRESIDENT), IN THE CHAIR.

Present:

Trustees.—Earl Cathcart, Lord Egerton of Tatton, Col. Sir Nigel Kingscote, K.C.B., Sir A. K. Macdonald, Bart., Duke of Richmond and Gordon, K.G.

Vice-Presidents.—H.R.H. Prince Christian, K.G., Mr. Chandos-Pole-Gell, Viscount Emlyn, Earl of Feversham, Mr. Walter Gilbey, Earl of Lathom, G.C.B., Right Hon. Sir Massey Lopes, Bart., Lord Moreton, Sir J. H. Thorold, Bart., Mr. Charles Whitehead.

Other Members of Council.—Mr. G. M. Allender, Mr. J. H. Arkwright, Mr. Alfred Ashworth, Mr. Joseph Beach, Mr. J. Bowen-Jones, Lord Brougham and Vaux, Mr. J. A. Caird, Earl of Coventry, Mr. Percy E. Crutchley, Mr. Alfred Darby, Mr. J. Marshall Dugdale, Mr. W. Frankish, Mr. Hugh Gorringe, Mr. R. Neville-Grenville, Mr. Anthony Hamond, Mr. Charles Howard, Mr. C. S. Mainwaring, Mr. Joseph Martin, Mr. T. H. Miller, Hon. Cecil T. Parker, Mr. Dan. Pidgeon, Mr. J. E. Ransome, Mr. G. H. Sanday, Mr. W. T. Scarth, Mr. A. J. Smith, Mr. Henry Smith, Sir J. L. E. Spearman, Bart., Mr. E. W. Stanyforth, Mr. Richard Stratton, Mr. Martin J. Sutton, Mr. Garrett Taylor, Mr. R. A. Warren, Mr. E. V. V. Wheeler, Mr. C. W. Wilson, Sir Jacob Wilson.

Mr. A. C. Cope, of the Board of Agriculture.

Officers.—Mr. Ernest Clarke, Secretary; Dr. Fream, Editor of the Journal; Dr. J. Augustus Voelcker, Consulting Chemist; Mr. Wilson Bennison, Surveyor.

The following members of the Chester Local Committee were also present:—The Mayor of Chester (Mr. Charles Brown), the Town Clerk of Chester (Mr. Samuel Smith), the City Surveyor of Chester (Mr. J. Matthews Jones), Mr. William Peers, Mr. John Scovell, Mr. George A. Dickson (Honorary Secretary of the Local Committee).

Apologies for non-attendance were received from Viscount Bridport, Mr. John Dent Dent, and Mr. Tremayne.

Death of a Member of Council.

The PRESIDENT said it was his painful duty to report officially to the Council the death of a member of their body, Mr. C. De L. Faunce De Laune. Elected a member of the Council in 1885, Mr. De Laune had since that time rendered valuable services upon the Chemical and Seeds and Plant Diseases Committees, and more recently upon the Journal and Education Committees also; and he (the President) was sure he was only representing the general feeling of the Council in expressing their deep regret at the loss of so valued a colleague.

Election of New Governors and Members.

The minutes of the last monthly meeting of the Council, held on November 2, having been approved, the election of the following four Governors and 56 Members was then proceeded with:—

Governors.

GARDNER, Right Hon. Herbert, M.P...48, Charles Street, Berkeley Square, W.
HESKETH, R. B...Gwrych Castle, Abergele.
SUTHERLAND, Duke of..23, Berkeley Sq., W.
WILSON, Sir Jacob..Chillingham Barns, Belford, Northumberland.

Members.

ARMITAGE, F...Edgerton Hill, Huddersfield.
BOSCAWEN, T. G...The Cumbers, Whitchurch, Salop.
BOSTON, Lord..Hedsor, Maidenhead.
BRITTEN, Capt. R. F., R.N...Kenswick, Worcester.
BROCKLEBANK, J...Bassingham, Newark.

Brooke, J. C. E. H...Hinton House, Brackley.
Davies, J. E...Mold, Flints.
Dymond, T. S...37, Hart Street, W.C.
Edmunds, C. F...Bodicote, Banbury.
Elwell, G...Stewponey Farm, Stourbridge.
Ellwood, O...Connah's Quay, Flint.
Ewing, G. B...6 Walton Place, Chelsea.
Farquharson, A. H...Invercauld, Ballater.
Ford, H...Gussage St. Michael, Cranborne.
Gifford, H. J...Lyston Ct., Tram Inn.
Goff, Major G. L. J...Hale Park, Salisbury.
Greene, C. W...Murray Hill Hotel, New York City, U.S.A.
Grice, A...Halton Lodge, Runcorn.
Higgins, G. F...Turvey Ho., Turvey, Beds.
Jones, S...Saighton, Chester.
Jones, W. E. Wyndham..Hall Place Cottage, Maidenhead.
Karslake, W. R...Kingsland, Eastbourne.
Keogh, H. C...Kilbride, Tullow, co. Carlow.
Kerwood, S. S...Water Eaton, Oxon.
Krukoff, N...Chabárovka on the Amoor, Russia.
Marchant, J. F...59, Berners Street, W.
Markham, J. W...Wendover Lodge, Tring.
Marr, J...Park Ho., Hunmanby, Yorks.
Mitchell, Tom, Eccleshill, Bradford.
Moore, T. O...Pickmere Hall Farm, Knutsford.
Morris, R. T...Oakington, Cambs.
Muzeen, G. E. B ..Douthwaite Lodge, Kirbymoorside.
Nichols, E...27, New St., Worcester.
Norris, W. H. P...Holme Pierrepont, Nottingham.
Palacios y Villacampa, Manuel..R.Agr. College, Cirencester.
Paul, W. F...Orwell Lodge, Ipswich.
Pearson, J. T...Ocle Pychard, Hereford.
Philips, G...St. Leonards, West Malling.
Roberts, J...Geinas Ho., Bodfari, Trefnant.
Scott, T. W. R...Lethem, Jedburgh.
Smith, H. R...1, Exchange Buildings, Bradford.
Steele, M...Newton Hall, Frodsham.
Stephens, S. S...Stedcombe Manor, Axmouth.
Studds, W...Iver, Uxbridge.
Sumner, J...Bickley, Malpas.
Taylor, W. F...Estate Offices, Dudley.
Thirkell, S...Goldwell, Biddenden, Kent.
Timmis, R. W...Brockton Ho., Worthen, Salop.
Trodd, J. W...Board School, Ryde, I. W.
Walton, W...Grove Pk., Kingsbury, Middlesex.
Walton-Wilson, H. W...Trinity College, Cambridge.
Watts, H...Plaistow, Billingshurst.
Webster, A. M...Welshpool.
Wolfson, H. Santa Cruz de Tenerife, Canary Islands.
Wood, John...43, Upper Brook St., W.
Wrench, F...Killacoona, Ballybrack, co. Dublin.

Resignation of Sir Jacob Wilson as Honorary Director.

The President then read the following letter addressed by Sir Jacob Wilson to the Secretary :—

Chillingham Barns, Belford,
November 4, 1892.

Dear Mr. Clarke,—In any arrangement that may be in contemplation for the future management of the Country Meetings of the Royal Agricultural Society, may I ask to be relieved of the duties of Honorary Director?

I have contemplated taking this step for some time past, but my impaired health and recent illness have now decided me forthwith to adopt this course.

You may rest assured that I shall still continue to render every assistance in my power in the administration of this Society, in which I have ever taken so deep an interest.

I remain, dear Sir,
Very faithfully yours,
(Signed) Jacob Wilson.
Ernest Clarke, Esq.

The Duke of Richmond and Gordon : I am gratified at being selected by my colleagues to propose a resolution to do honour to a very old friend with whom I have been associated in a variety of capacities for a great many years. It is needless that I should say very much in praise of Sir Jacob Wilson in addressing the members of the Council of the Royal Agricultural Society, because he is well known to all, and intimately known to a great number. The services which Sir Jacob has rendered, not only to this Society, but to the public at large, on every occasion when they have needed to consult him as Honorary Director of our Country Meetings, have been invaluable. His courtesy and urbanity under all circumstances are familiar to all, and his good-humour has never been known to fail. Whether under the hot burning sun of the Windsor Meeting, or among the swamps of the disastrous show at Kilburn—when we walked about the Showyard on planks—Sir Jacob Wilson has never once lost his temper or relaxed his exertions. When, as Lord President of the Council, I was instrumental in the introduction of the Cattle Diseases Bill, I found the very greatest assistance from the advice of Sir Jacob Wilson, as well as from my lamented friend, the late Mr. Thomas Booth; and in the deliberations of the Royal Commission on Agricultural Depression, of which I had the honour to be Chairman, no one gave more valuable assistance than Sir Jacob. I have said it is unnecessary for me to recapitulate at any great length the

services which Sir Jacob Wilson has rendered to the Royal Agricultural Society, because they are so well known. But I may remind you that his first appearance at the Society's shows was at Carlisle in 1855, thirty-seven years ago, and he has, with only one or two exceptions, been present at each subsequent Meeting to the present day. He became a member of the Royal Agricultural Society on December 5, 1860, and he was first engaged in an official capacity at our shows as judge of steam cultivators at the Worcester Meeting of 1863, now nearly thirty years back. He was elected a Member of Council on May 22, 1865, and is now the senior ordinary Member of Council. He was appointed a Steward of Stock in 1869, and acted in that capacity at the Manchester (1869), Oxford (1870), Wolverhampton (1871), and Cardiff (1872) Meetings. On the retirement of Mr. Brandreth Gibbs in 1875, he was unanimously elected Steward of General Arrangements, and subsequently Honorary Director. He was Chairman of our Showyard Works Committee from 1877 to 1881, and from 1889 to the present time. He was also Chairman of the Stock Prizes Committee from 1883 to 1884, and from 1886 to 1888. He took a prominent part in inaugurating the scheme of premiums to thoroughbred stallions, now under the charge of a Royal Commission, on which he is the member representing the Society; and he has assisted in the deliberations of this Council in a great variety of other ways. The resolutions which I have now the pleasure to propose refer only to Sir Jacob's services as Honorary Director, and it must not be supposed that the "conspicuous services rendered during eighteen years" referred to therein comprehend the whole of Sir Jacob's services to the Society. For a period very much longer than that, in fact for nearly thirty years, Sir Jacob has been helping on in one capacity or another the work of this great institution, and though he has now decided to retire from the anxious duties of Honorary Director, we may hope that he may give us for a long time to come the benefit of his help and counsel. (Loud cheers.)

His Grace then formally moved the following resolutions:—

1. That this Council has received with great regret the resignation by Sir Jacob Wilson of the office of Honorary Director of the Country Meetings of the Society. The Council desires to place on record its high appreciation of conspicuous services rendered during eighteen years, which services have signally conduced to the welfare and advantage of the Society.

2. That Sir Jacob Wilson be elected a Life Governor, and that he be requested to accept from the Society a piece of plate of the value of 100 guineas, in grateful recognition of the invaluable services rendered by him.

Mr. CHARLES HOWARD said he had very great pleasure indeed in rising to second the resolution which had been so ably proposed by His Grace. As an old Steward of Stock, he had had ample opportunities of knowing the extent and the value of Sir Jacob Wilson's services, and he thought the country, and the Society especially, owed him a deep debt of gratitude. Sir Jacob had great organising powers, and all his duties were carried out with the greatest precision and order. (Cheers.) In the carrying out of all these onerous duties, he had had at times great provocation; but he (Mr. Howard) could safely and truly say that no man ever saw him lose his temper. He was one of the most unselfish, generous, and kind-hearted men it had ever been his pleasure to know. Nothing, he believed, gave him greater happiness than that he could do a good turn to others. Thousands of his countrymen would rejoice at the great improvement in his health, and at the prospect of his being able to resume the duties of his well-earned appointment. Well would it be for the country if it had more such men in it as Sir Jacob Wilson! He had great pleasure in seconding the resolutions.

The resolutions were carried unanimously by acclamation, and it was agreed that they should be engrossed on vellum, and sealed with the seal of the Society, and that they should

be presented to Sir Jacob, together with the plate, at the General Meeting of governors and members of the Society, to be held at noon on Thursday, December 8 (see page cxcv).

On Sir Jacob Wilson subsequently entering the Council-room,

The PRESIDENT acquainted him with the resolutions which had been passed, and said: The Duke of Richmond has referred to your services as Honorary Director during eighteen years, but wished at the same time to emphasise very strongly that your services, rendered not only to the Society, but to the whole of the agricultural community in England, have lasted very much longer than that time—in fact, much nearer thirty than eighteen years. I am quite sure it is the feeling of the Council, and the feeling of all the members of the Society, that our thanks are not limited to your tenure of office as Honorary Director, but extend over the whole period of your association with the Society. These resolutions have been received by every member of Council with acclamation, and as I shall have to say a few words on the same subject at the general meeting tomorrow, I will not now do more than acquaint you with the terms of the resolutions that have been so cordially passed.

Sir JACOB WILSON, who on rising was greeted by loud applause, said: In the announcement which has just been made by your Grace as President of the Society, you have done me great honour. No distinction, I take it, should be more eagerly sought or more highly prized than the commendation of one's fellow-men for work done or duties performed. This I have received in the resolutions which have been passed to-day, my thanks for which I find it impossible to express in terms satisfactory to myself, or expressive of the emotions which I feel. But I cannot but think that the Council in its generosity has very much overrated my humble services. ("No, no.") I have done no more than any gentleman in this room would have done in the same position—my duty. If I felt that in resigning the position, which by your favour I have occupied for eighteen years as Honorary Director, my connection with this Society were to cease, it would indeed have caused me very sincere regret. But this, fortunately, is not to be. By your kindness in electing me a Governor of the Society my connection with it and my devotion to its interests will, as far as health permits, still continue. It is, therefore, with unalloyed pride and pleasure that I receive this generous expression of your appreciation of my services, because I hope I may without undue vanity read in the resolutions not merely a conventional vote of thanks, but also an expression of your friendship and goodwill. My Lord Duke, I can say no more at present, but once more I thank you from the bottom of my heart. (Loud cheers.)

The reports of the various Standing Committees were then presented and adopted, as below:—

Finance.

Sir NIGEL KINGSCOTE (Chairman) reported that the accounts for the month of November, as certified by the Society's Accountants, showed receipts amounting to 451*l.* 18*s.* 2*d.*, and expenditure amounting to 2,710*l.* 11*s.* 5*d.* The balance at the bankers' on November 30, 1892, allowing for cheques outstanding, was 3,022*l.* 5*s.* 8*d.* Accounts amounting in all to 2,087*l.* 12*s.* had been passed, and were recommended for payment. The Committee had considered the question of free tickets to subscribers to the local fund, and they recommended that for each 10*l.* contributed to the Society's expenses in the shape of subscriptions or local prizes, the Local Committee be given for distribution two season tickets and two day tickets. The Secretary had submitted a statement of the arrears of subscriptions at the present time, and had been instructed to press for those still outstanding. The Committee announced with great regret the resignation as a member of the Committee of Lord Bridport, who had been a member of it since the year 1859, and was Chairman from 1861 to 1875, the year when he became President of the Society. The Committee had met eleven times during the year, and made eleven reports.

House.

Sir NIGEL KINGSCOTE (Chairman) presented the recommendations of this Committee as to various matters connected with the Society's house. The Committee had appealed unsuccessfully against the recent assessment of the Society's house for Inhabited House Duty. The Committee had met nine times and made nine reports.

Journal.

Earl CATHCART (Chairman) reported that a paper on Cottage Sanitation, which had been prepared under the direction of Mr. T. Pridgin Teale, F.R.S., to whom the Society was much indebted for his services in the matter, would be published in the next number of the Journal. A fourth edition of Mr. Whitehead's *Hints on Vegetable and Fruit Farming* was in the press, and would be issued on January 1, 1893. Various presentations to and purchases for the Society's Library were reported. The arrangements for the next number of the Journal had been considered, and directions thereon given to the Editor.

Chemical.

Viscount EMLYN (Chairman) reported that the Report of the Woburn Sub-Committee had been received and adopted. Dr. Voelcker had laid on the table the Annual Report for 1892 of the Consulting Chemist, which was recommended for publication in the Journal (see p. 784). The Quarterly Report had been considered, amended, and adopted. The Committee had met eight times, and made eight reports.

On the motion of Viscount EMLYN, the Quarterly Report of the Chemical Committee was ordered to be published in the next number of the Journal (see p. 752).

Lord EMLYN stated that it had been decided yesterday by the Woburn Sub-Committee that the Cambridge and county agricultural students should be afforded facilities for studying the experiments at the Society's Experimental Farm at Woburn. Of course they were anxious that every possible use should be made of the Woburn experiments.

Seeds and Plant Diseases.

Mr. WHITEHEAD (Chairman) reported that Dr. Voelcker had submitted a draft report upon the result of the experiments on potatoes with *bouillie bordelaise* during the last season, which the Committee had adopted, and which they recommended for publication in the next number of the Journal (see p. 761). The Committee had again given careful consideration to the question of the appointment of a consulting naturalist to the Society. They proposed that the Society should appoint a Zoologist, with a scientific knowledge of the animal kingdom, who should devote himself to the investigation of animals, vertebrate and invertebrate, which affect the economy of the farm. The Consulting Botanist had presented his annual report, which the Committee recommended for publication in the Journal as usual (see p. 792). The Committee recommended that three prizes of 3*l.*, 2*l.*, and 1*l.* be offered in connection with the Chester Meeting for the best air-tight receptacles for jams, preserved fruits, vegetables, &c., suitable for household purposes. The Committee had met eight times, and made eight reports.

Mr. WHITEHEAD said that the question of an appointment of a consulting naturalist had received very careful and lengthy consideration by the Seeds and Plants Committee. They had hoped to have been able to recommend to the Council the appointment of an eminent authority conversant with zoology as an honorary officer of the Society. One distinguished gentleman had been approached with this object, but he had said that he had not sufficient time to devote to such an office, although he appreciated very highly the honour proposed to be conferred upon him. Upon further consideration the Committee came to the conclusion that it would be impossible to expect to get the services of any such distinguished authority on zoology; and, therefore, they resolved to recommend to the Council to appoint, after careful selection, a young man, of course highly educated and having a distinct bent towards zoological

knowledge, who might be trained in the practical work of the Department. Under these circumstances, the Committee made their recommendation to the Council as the best possible solution of this difficult question. They recognised that it was impossible to get *per saltum* an accomplished economic entomologist; and the best plan, therefore, was to get a young man, and induce him by a fair salary, and the prospect of an increment, to devote himself to the study of natural history as applied to agriculture.

Finger-and-Toe in Turnips.

Earl CATHCART called the attention of the Committee to the subject of finger-and-toe in turnips, which was a very serious matter in some localities. There ought to be a paper on this subject in the Journal, and he hoped that Mr. Whitehead and his Committee would be good enough to arrange for such a paper for the Society.

Mr. WHITEHEAD replied that there was a paragraph in the Consulting Botanist's Report, alluding to this finger-and-toe disease, which was scientifically known as *Plasmodiophora Brassicæ*. Mr. Carruthers had had several complaints of this disease affecting turnips, which was, as the Council probably knew, caused by a fungus. The Seeds and Plants Committee would take the matter into consideration.

Potato Experiments.

With reference to the Society's experiments upon potatoes, Mr. WHITEHEAD said that the full results would appear in the Society's Journal, but the Council would be interested in knowing that putting together the results obtained from the different stations, excluding Cheshire, there was an unanimous verdict upon four points:—(1) That the dressing with *bouillie bordelaise*, though it does not entirely prevent disease, has a marked effect in lessening the extent to which disease spreads. (2) That associated with the lessening of disease is an almost certain increase of crop, which more than pays for the cost of application of the dressing. (3) That the best treatment is an early application of the *bouillie bordelaise* before disease has made its appearance, and that this should be repeated if the marks of the first dressing have been removed by rain. (4) That, even if delayed until disease comes, a lessening of the spread of disease may be to some degree effected by a late dressing, and the crop, as a rule, will be sufficiently increased to pay for the application. These results were borne out by four of the five stations at which the experiments were complete, those in Kent, Bedfordshire, Lincolnshire, and Devon exemplifying them almost in every particular, even with the many plots comprising the experiments at each spot. The results in Cheshire were the only ones that told adversely to the utility of the dressing, and even here, in the case of one of the four crops, a large gain in yield was experienced. The general results might accordingly be stated as distinctly showing the advantage of using the *bouillie bordelaise* dressing, whether disease appears or not, and that the best plan was to apply the dressing about a fortnight before the disease was likely to appear, and to renew it when washed off.

Veterinary.

Sir JOHN THOROLD (Chairman) reported officially the result of the deputation to the President of the Board of Agriculture on the 4th ult., in reference to the importation of cattle affected with pleuro-pneumonia from Canada, and a copy of the "Animals Amendment Order of 1892, No. 9," providing that from the 21st ult. cattle brought from Her Majesty's possessions in North America should be subject to slaughter at the port of landing, was laid upon the table. Of the 600*l.* granted to the Committee for the year 1892, they had expended 558*l.* 8*s.* 6*d.*, and they asked for a renewal of the grant of 600*l.* for the year 1893, 500*l.* of this sum to be allocated to the Royal Veterinary College for the study of comparative pathology and bacteriology. They had met eight times and made eight reports.

The following report had been

presented by Mr. Cope for Professor Brown:—

Pleuro-pneumonia.—Only one case of this disease has been discovered since the beginning of November on premises in Great Britain, apart from the foreign animals' wharves. This case was in one of the Canadian cattle landed at Dundee at the beginning of October, and the disease was only discovered on slaughter early in November, and this discovery led to the slaughter of over 100 other healthy cattle in contact.

Swine Fever.—In the nine weeks ended November 26, there were reported 446 fresh outbreaks of this disease in Great Britain: 2,002 pigs were attacked by the disease, 916 diseased swine were killed, 815 died, 142 recovered, and 195 of the diseased were still alive when the last published return was made up.

Anthrax.—During the months of October and November there were fifty-five outbreaks of anthrax in Great Britain; 117 animals were attacked, fourteen diseased animals were killed, eighty-eight died, fourteen recovered, and two remained alive at the date of last return.

Glanders (including Farcy).—In Great Britain, according to the returns published for the nine weeks ended November 26, there were 273 outbreaks of these diseases in Great Britain and 552 horses were attacked; 203 of the outbreaks and 420 of the horses attacked were in London.

Rabies.—There have, within the past few weeks, been ten cases of this disease in England: these occurred in the counties of Hants, Lancaster, London, and York (N.R.)

Importation of Foreign Live Stock.

Mr. Stratton desired to move a resolution similar to that passed by the Smithfield Club and other societies to the effect that all foreign animals should be slaughtered at the port of debarkation. There was a general feeling that the country, being so deeply interested in the suppression of pleuro-pneumonia and foot-and-mouth disease, ought to pass a measure that foreign animals should be all slaughtered at the port of debarkation, or be subjected to quarantine for ninety days. He did not know whether the Veterinary Committee had discussed this matter.

Sir John Thorold stated the question had not yet been under the consideration of the Veterinary Committee, and that, therefore, at the present moment, it was a question for the Council to consider.

Mr. Martin seconded Mr. Stratton's motion.

The President said that he did not know whether Mr. Stratton wished on that occasion to raise a discussion on the subject, which was a large one. It was proved the other day that whilst inspectors could detect any outward symptoms of disease, they were utterly unable to do so when the symptoms were latent. Everybody would agree that it would be most desirable that foreign animals should all be slaughtered at the port of debarkation.

The Duke of Richmond and Gordon said that this was possibly one of the most important subjects that could be brought before them. He scarcely thought that a motion of that kind should be made without due notice being given, so that the Council might be prepared to discuss it. He did not agree at all that this motion would be passed unanimously without discussion. He thought a good deal might be said both for it and against it. He deprecated very much that the Council without discussion should come to a resolution that all animals should be slaughtered at the port of landing. It might be that it would be a benefit, but he rather suspected that if the Council were to pass the resolution, it would not go very much further than that room; because if it were put before the Government, he did not imagine that they would be prepared to bring in a bill for the slaughter of all animals at the port of landing, or if they did, that they would be able to carry it. He would not argue the matter further on the present occasion, but he suggested that so large a question

ought not to be discussed without due notice.

Mr. STRATTON then said that he would give notice of the following motion for consideration at the next meeting of Council:—

> That in the interests of the producers and consumers of meat in the United Kingdom, it is essential, as a safeguard against the introduction of foreign contagious diseases with animals, that all cattle, sheep, and swine imported into the United Kingdom from foreign countries be slaughtered at the port of debarkation, except in special cases, when they may be admitted under such conditions as the Board of Agriculture may from time to time consider necessary.

Stock Prizes.

Mr. SANDAY (Chairman) reported that the reserve number in Class 45 at the Warwick Meeting, Mr. W. Graham's "Windsor's Beauty," and the highly commended animal, Mr. T. E. Walker's "Baroness 9th," had been both disqualified through non-compliance with the regulation as to calving, and the Committee recommended therefore that the third prize in Class 45 be cancelled. The Committee recommended that the following offers of champion prizes for the Chester Meeting be accepted with thanks:—Two gold medals for the best Hackney stallion and the best Hackney mare, from the Hackney Horse Society; and two prizes of 10*l.* each for the best Red Polled bull and the best Red Polled cow or heifer, from the Red Polled Society. The Committee had further considered the subject of the champion prize offered by the English Jersey Cattle Society for the cow yielding the largest quantity of butter by practical test of the churn, and they recommended that such prize be accepted, the prize to be awarded to the cow yielding the largest quantity of butter in proportion to her live weight, by practical test of the churn. A letter was read from Mr. Hamond suggesting the addition of prizes for Hackney fillies foaled in 1890, 1891, and 1892; but the Committee were of opinion that as the Hackney classes had been considered at several meetings, it was now too late to make any alterations. The list of prizes offered by the Chester Local Committee had been further considered and approved. The final revision of the Prize Sheet for the Chester Meeting had now been completed by the Committee, and they recommended it to the Council for approval and issue forthwith. They further recommended that the Chairman be empowered to accept any champion prizes from Breed Societies which might be offered before the Prize Sheet was printed, and which complied with the regulations of the Prize Sheet. The total value of prizes offered at the Chester Meeting, exclusive of champion prizes, plate, and medals offered by various Breed Societies, would be 6,227*l.*, of which amount 1,428*l.* were contributed by the Chester Local Committee.

The Committee had met eight times during the year, and had made eight reports.

Railway Charges.

The Earl of COVENTRY said that yesterday, at a meeting of the Smithfield Club, the new departure of the railway companies in charging fares for grooms and herdsmen accompanying stock was discussed, and it was resolved to send a deputation to the railway companies from the Council of the Club to appeal against the alteration. At the same time, the hope was expressed in the room that Council might join the deputation. It was felt by all that the alteration came at a very bad time, especially when they took into consideration the great advantages which the companies derived from the carriage of stock to and from the shows. He hoped the Council would see their way to appoint a deputation to appeal against the alteration. He moved a resolution to this effect.

Mr. A. J. SMITH having seconded the motion,

The Duke of RICHMOND and GORDON said he would not move any amendment, but he thought that they ought also to take into consideration the reduction of other charges which the companies might be making, as otherwise they would be placed in a

false position. He did not mean to say that it was not right for the Society to object to the rates, but he rather wanted to see exactly what the rates to be charged by the companies were when their scale came out on January 1.

Lord COVENTRY said that then it would be too late to object.

The Duke of RICHMOND did not agree in this, because the railway companies could alter their charges whenever they liked.

H.R.H. Prince CHRISTIAN said it had been settled that the deputation should go to-morrow from the Smithfield Club.

Mr. BOWEN-JONES said that the Duke of Richmond's arguments only applied if the railway companies' charges were reduced in other directions. If this were not so, then it would be a reasonable thing to accede to the request of Lord Coventry. But the general impression in the agricultural world was that the railway companies had not shown themselves particularly favourable to agricultural interests. They would not prejudice their case by going before the Clearing House and making this reasonable request. He heartily supported Lord Coventry's motion. In regard to the deputation being received to-morrow, he understood from the Secretary of the Smithfield Club that the railway companies were not prepared to meet them at so early a date; but that at a later date they would receive a deputation which was proposed to be sent by other societies. He heartily concurred in the suggestion that they should join those other societies, and by unity strengthen their case as much as possible.

Mr. WALTER GILBEY thought their position would be very much stronger if they went to the companies before the new regulations were put into force.

The motion was then adopted *nem. dis.*, and the names of Mr. Martin Sutton and Mr. Garrett Taylor were suggested by Lord Coventry as the Society's representatives upon the proposed joint deputation.

Implement.

Mr. SANDAY reported that the arrangements for the trials of sheaf-binders at Chester had been considered, and the Committee recommended the appointment of three judges for these trials. They further recommended that trials of oil-engines take place in connection with the Country Meeting of 1894. The Committee had met eight times, and made eight reports.

General Chester.

The Earl of FEVERSHAM reported that the Local Committee had undertaken to submit a list of twelve typical farms in District G, from which the Council could select certain farms for their Commissioner to visit. The question of free tickets to subscribers to the local fund had been discussed, and the Committee concurred in the proposals of the Finance Committee. The Local Committee had nominated as agent for lodgings, Mr. W. E. Brown, Newgate Street, Chester, and as agent for the sale of dairy produce, &c., Mr. Challinor, Secretary of the Cheshire Dairy Farmers' Association, Chester.

Showyard Works.

Sir JACOB WILSON (Chairman) reported that the tenders for the supply of timber and for lavatories at the Chester Meeting had been considered, and he presented the Committee's recommendation that the tender of Messrs. Wade, Son, and Co. for timber, and of Mr. George Barlow for lavatories, should be accepted. The Surveyor had submitted plans for the re arrangement of the offices in the Showyard, and the Committee recommended that a cloak room be provided in the Members' Pavilion, in which coats and parcels could be deposited by members of the Society on receipt of tickets, the Society in no case accepting any responsibility; that the stables be removed from the Stewards' offices and placed behind the Royal Pavilion; and that the lavatory and Council-room be placed behind the Stewards' offices. A letter had been received from the Agricultural Exhibitors' Association asking the Society to appoint two representatives on the deputation to the Clearing House Committee on the 8th inst. on the subject of rates, fares, and carting to and from the Show

The Committee could not recommend that the request be complied with. The Committee recommended that in future Governors of the Society be allowed the same privileges in the Showyard as members of Council. The Committee had met nine times, and made nine reports.

Selection.

Earl CATHCART (Chairman) reported officially the death of Mr. De Laune, a Member of the Council. The Committee thought that as only one member of Council now remained for the county of Kent, the vacancy should be filled up from that county. They proposed to consider at their next meeting the names of candidates that might be submitted to them. A letter had been read from Dr. Maercker, thanking the Society for his election as an honorary member. The Committee recommended that Mr. P. A. Muntz, M.P., be elected a Steward of Stock, and that Sir Joseph Spearman be elected a Steward of Implements; and that the Committee of Inspection for the Country Meeting of 1894 be constituted as follows:—The President, Mr. Bowen-Jones, Sir John Thorold, Mr. Rowlandson, the Earl of Coventry, Mr. Stratton, and the Secretary.

Dates of Council Meetings in 1893.

A discussion arose as to the date of the meeting of Council to be held in April next. The first Wednesday of that month, which in the ordinary course would be the date of the meeting, falls in 1893 on Easter Wednesday, and it was therefore decided to hold the April meeting on Wednesday, April 12, 1893, instead of April 5. The following will therefore be the dates of the monthly Council Meetings for the remainder of the session of 1893: February 1, March 1, April 12, May 3, May 31, June 21 (in Chester Showyard), and July 26.

Education.

Mr. ARKWRIGHT reported that the copies of the fourth edition of the Society's Text Book on Agriculture were ready for issue. Copies of the German edition of the Text Book, published by Herr Paul Parey, of Berlin, were laid upon the table. Of the forty-three candidates from the thirteen schools who entered for the Society's Junior Examinations on the 8th and 9th ultimo, twenty-four obtained the qualifying number of marks. Of the twenty-four successful candidates, the first ten would receive scholarships upon complying with the Society's regulations, and the remainder would receive certificates. The Committee presented a report on the results of the examination for publication in the Journal (see p. 756).

The Committee recommended that the usual honorarium be paid to the Examiners, and that letters of thanks be sent to these gentlemen, as well as to the Local Secretaries who conducted the examinations in the different centres. The attention of the Committee had been drawn to an announcement that the Devon County Council would award three scholarships of the value of 40*l.* a year each for three years upon the results of the Society's Junior Examination to candidates in the county of Devon. This was the first instance of the kind which had come to the notice of the Committee, and they welcomed the action of the Devon County Council as indicative of a practical interest in the educational work of the Society. They did not doubt but that other county councils might be induced to follow this example. A letter from the Kent County Council, asking if the Society would undertake the examination of students attending village lectures on the principles of agriculture, was read, and the Secretary directed to reply that the Society could not undertake this duty. Of the 500*l.* granted to the Committee for the year 1892, they had expended 478*l.* 18*s.* 11*d.*, and they asked for a renewal of the grant for the year 1893. The Committee had met eight times and made eight reports.

Dairy.

The Hon. CECIL T. PARKER (Chairman) reported that a further letter had been received from the

English Jersey Cattle Society, in reference to the proposed prizes for dairy cattle, subject to a butter test by the churn, and the Committee had agreed in the recommendation of the Stock Prizes Committee that the champion prize of 25*l.*, offered by the English Jersey Society, be accepted for the cow in either class (*i.e.*, 1,100 lb. and over, and under 1,100 lb. live weight) making the largest quantity of butter in proportion to her live weight. The Committee had again considered and finally revised the prize-sheet for 1893, relating to poultry, table-poultry, produce, and butter-making competitions, and had amended the regulations relating thereto. They recommended the addition of a class for "Three Small Cheeses, under 2 lb. weight each," with prizes of 3*l.*, 2*l.*, and 1*l.* The Committee had expended 98*l.* 15*s.* 1*d.* of their grant of 100*l.* for the year 1892, and asked for renewal of the grant for the year 1893. The Committee had met eight times and made eight reports.

Standing Committees for 1893.

The following Standing Committees were appointed for 1893 :—Finance, House, Journal, Chemical, Seeds and Plant Diseases, Veterinary, Stock Prizes, Implement, General Chester, Showyard Works, Selection, Education, Dairy.

The present members of the various Standing Committees were (with some exceptions) reappointed to those Committees; Mr. Ashworth was added to the Finance Committee; Mr. Terry to the Woburn Sub-Committee; Mr. Rowlandson to the Chemical Committee; Hon. Cecil T. Parker to the Seeds and Plant Diseases Committee; Prof. McFadyean (Dean of the Royal Veterinary College) to the Veterinary Committee; Mr. Beach, Mr. Stanyforth, and Mr. Wheeler to the Stock Prizes Committee; Mr. Crutchley and Lieut.-Col. Curtis Hayward to the Implement Committee; and Mr. Neville-Grenville to the Dairy Committee. To replace Sir John Thorold, Mr. Crutchley, and Mr. Neville-Grenville, who retired by rotation from the Committee of Selection, the Earl of Coventry, Mr. Gilbey, and Mr. Rowlandson were elected.

Committee for Selection of Judges.

On the motion of Sir JACOB WILSON, a Committee was appointed to recommend judges of stock, poultry, and produce at the Chester Meeting; such Committee to consist of the members of the Stock Prizes Committee and the Stewards of the several departments.

Special Officers Committee.

Sir JOHN THOROLD (Chairman) stated that this Committee, having carefully considered the matters referred to them, had agreed upon the following report :—

1. It being necessary to provide for the future carrying out of the duties performed by Sir Jacob Wilson, as Honorary Director, with so much ability and with such great benefit to the Society during the last eighteen years, the Committee recommend that there shall be an Honorary Director for the Country Meetings, appointed for three years, who will have the supervision of the entire Showyard, and act in concert with the Stewards of Departments when appealed to by them, or when his assistance may be necessary. He will have the entire direction of all matters which are not included in the duties of the other Stewards, and he may be appealed to upon all questions which do not come within the departments of the Secretary or the Stewards of Stock, Implements, or Finance. He will also arrange for the Stewards' messing.

2. The Committee consider that the Honorary Director should invariably be a member of the Showyard Works Committee.

3. The Committee are of opinion that the Assistant Stewards and Foremen should be appointed by the Honorary Director, after consultation with the Stewards of the several departments, and that he should be provided with a clerk from the Secretary's office.

4. If these recommendations be approved, the Committee propose that the Committee of Selection be requested to suggest at the next

meeting of the Council the name of an Honorary Director to hold office for three years.

5. The Committee are of opinion that the Secretary's duties should comprise generally all duties of a clerical and financial character, including the control and checking of estimates and other financial negotiations, except only in the case of necessary expenditure by the Honorary Director or the Stewards, the amounts in such cases to appear in the counterfoils of their respective order-books; the engagement of all lodgings required for the officials; and the hire of all carriages required for the Show. They are also of opinion that he should be responsible for the Award Office.

6. The Committee recommend that the office of Superintendent of the Yard be discontinued, and that the duties be discharged by a Foreman of the Yard.

7. They are of opinion that in future it is not desirable that the Stewards of Finance should in any case act for a longer period than four years, to be eligible for re-election after an interval of two years.

8. A letter was read from Mr. Frankish with reference to the duration of the Shows, but the Committee did not consider that this came within the terms of the reference to them. The suggestion made by him that the Secretary's office should be transferred to the middle of the yard had already been considered, but was not deemed desirable.

9. The Committee, having now concluded their labours, desire to express their thanks for the very valuable assistance which they have received from Sir Jacob Wilson and the various officers of the Society who have given evidence before them. (Signed)

J. H. THOROLD, Chairman.

December 5, 1892.

Sir JOHN THOROLD, in presenting this report, explained that in the first instance it had been proposed to appoint a Steward of General Arrangements, but they learned from Sir Jacob Wilson that his predecessor, Sir Brandreth Gibbs, had always been called an Honorary Director. There was no reason why that name should not be retained, especially as it was a more convenient title to use than Steward of General Arrangements. They felt the necessity for the appointment of such an official, whose duty it should be to keep the whole Show together, and to keep things working properly. Their experience in the past led them to hope for the appointment of a successful manager.

Country Meeting of 1894.

The invitations from the Corporations of Cambridge and St. Albans for the holding of the Country Meeting of 1894 were further considered, and were referred to the Committee of Inspection, with instructions to bring up a report at the next meeting of the Council, to be held on February 1 next.

Miscellaneous.

The request of the Agricultural Exhibitors' Association that the Society would send two representatives to a deputation to the railway companies on the following day was considered, and it was decided that the request could not be complied with.

The report from the Council to the General Meeting having been prepared, and various letters and other documents having been laid upon the table, the Council adjourned over the Christmas recess until Wednesday, February 1, 1893.

Proceedings at Half-yearly Meeting of Governors and Members,

HELD IN THE HALL OF THE ROYAL MEDICAL AND CHIRURGICAL SOCIETY, 20, HANOVER SQUARE.

THURSDAY, DECEMBER 8, 1892,

THE DUKE OF WESTMINSTER, K.G. (PRESIDENT), IN THE CHAIR.

Present:—

Members of the Council.—H.R.H. Prince Christian, K.G., the Duke of Richmond and Gordon, K.G., Earl Cathcart, the Earl of Feversham, Lord Brougham and Vaux, the Hon. C. T. Parker, Sir Nigel Kingscote, K.C.B., Sir J. H. Thorold, Bart., Sir Jacob Wilson, Messrs. G. M. Allender, J. H. Arkwright, Alfred Ashworth, J. Bowen-Jones, James A. Caird, Charles Clay, Lieut.-Col. Curtis-Hayward, Messrs. W. Frankish, Walter Gilbey, H. Gorringe, A. Hamond, C. S. Mainwaring, P. A. Muntz, M.P., A. J. Smith, Henry Smith, Charles Whitehead, C. W. Wilson.

Governors.—Mr. Charles E. Ashworth, Mr. R. B. E. Gill, Mr. W. Barrow Simonds.

Members.—Sir H. M. Vavasour, Bt., Sir Wm. Vincent, Bt., Messrs. Thomas Bell, Wm. C. Booth, W. W. Chapman, Horace F. Cox, Wm. Fortune, H. J. Greenwood, Surgeon-Lieut.-Col. Ince, M.D., Mr. Frederick King, Col. Le Cornu, Messrs. H. F. Moore, John Moubray, F. O. S. Reade, Edmond Riley, E. S. Rodd, Frank Silvester, John Spratt, Fred Smith, Marshall Stephenson, C. L. Sutherland, F. T. Thatcher, Robert Thompson, Wm. Thompson, John Thornton, James Toller, James Watt, Dr. H. J. Webb, Jonas M. Webb, and others.

Report of Council.

The report of the Council for the past half-year (see p. 744) having been taken as read, the SECRETARY gave a brief synopsis of its contents.

Sir WILLIAM VINCENT, in moving the adoption of the report, said it was quite evident that though the great interest which the Society represented was terribly depressed, yet the Society was in a prosperous condition, inasmuch as it was doing most valuable work for the benefit of agriculture in this country. It did not attempt to solve the difficulties which were increasing in the agricultural interest at the present moment by advocating particular specifics. Yet he was quite sure that the members would agree from the report that the work which had been done was of an excellent character, and would cordially accept his motion for the adoption of the report.

Mr. W. BARROW SIMONDS (Foundation Life Governor) seconded the motion as one of the original members of the Society, of whom he was afraid there were now very few left.

Presentation to Sir Jacob Wilson.

The PRESIDENT then said: It becomes my duty to invite your attention for a few moments to a subject of importance. At the meeting of the Council, held yesterday, the Duke of Richmond and Mr. Charles Howard referred to the resignation by Sir Jacob Wilson of his office of Honorary Director, and bore eloquent testimony to the great value of his very eminent services, not only in his official capacity as Honorary Director, but also during the long time that he has been connected with the Council and with the Society. It becomes, therefore, my duty, as your President for the year, to express to Sir Jacob Wilson, in your name, our great and unfeigned regret that he should have found it

necessary, from various causes, to resign his position as Honorary Director of the Society. We tender to him our very cordial thanks for the devotion which he has uniformly shown to the best interests of the Society, and for the great administrative ability which he has displayed in organising the Shows of the Society at the different places where they have been held. We also bear our testimony to his unfailing good-humour, whether under cloud or sunshine, whenever brought into contact with members of the Council or others. Ever since he was first elected to the Council, twenty-seven years ago, he has taken an active part on nearly all the committees of the Council. He has been Chairman of the Showyard Works Committee for a considerable period. He has been Chairman of the Stock Prizes Committee, and has been an active member of the Veterinary, House, Implement, and other Committees. He has resigned the post of Honorary Director, but we sincerely hope that we may retain his very valuable services upon the Council. (Cheers.) We beg to offer to Sir Jacob Wilson the Life Governorship of the Society, and we hope he may retain that position for many years to come. I feel quite certain, gentlemen, that you will agree in my views, however inadequately expressed; and I ask you, Sir Jacob, to accept this address with the expression of our most cordial thanks, and also the recognition of your services, which has taken the concrete form of the service of plate now before you: and in the name of the Society I beg to express our sincere hopes that you may enjoy better health for many a long year to come, to carry out all the useful operations in which you have been so long engaged. As we wish you many years of usefulness, may they be coupled with many years of happiness! (Loud cheers.)

The PRESIDENT then formally handed to Sir Jacob Wilson the illuminated address containing the resolutions passed by the Council on the previous day, and at the same time asked his acceptance of the oaken chest containing the service of plate.

The presentation plate consists of a massive silver salver, weighing 200 oz., and of a tea and coffee service. The service is of an antique George III. pattern. The salver has a shell and gadroon border, with scroll handles, and has an engraved centre, with the following inscription:—

Presented by the
ROYAL AGRICULTURAL SOCIETY OF ENGLAND
to
SIR JACOB WILSON,
On his Resignation
of the Honorary Directorship
In grateful Recognition of Invaluable Services
rendered by him
during an Eighteen years Administration
of the Country Meetings of the Society.
December, 1892.

The resolutions passed by the Council on December 7, 1892, have been very handsomely illuminated on vellum, with a border after a general design by Mr. Ernest Clarke. At the top in the centre is the large die of the Society, surmounted by the Imperial crown. On either side are wheat-ears, with agricultural emblems in shields. At the foot on a scroll is the motto of the Society, "Practice with Science," flanked with other agricultural emblems and the monograms, "J. W." and "R.A.S.E." At the sides are shields bearing the names and dates of each of the eighteen Country Meetings of the Society at which Sir Jacob Wilson has acted as Honorary Director, from Taunton in 1875 to Warwick in 1892. The resolutions are sealed with the seal of the Society, and signed by the Duke of Westminster as President, the Duke of Richmond and Gordon (mover of the resolution) as Trustee, and Mr. Ernest Clarke as Secretary.

Sir JACOB WILSON, who on rising was greeted with loud applause, said: My Lord Duke, your Royal Highness, my Lords and Gentlemen,—There are occasions in the life of every man when he would prefer to be silent rather than to speak. I confess that for me this is one of them. Were I to keep silent, however, I know that you would understand that my reason for so doing was the difficulty I feel in endeavouring to express to you the emotions with which I have listened to the remarks of the noble Duke, and the generous approval with which you have received them. It is, however, necessary for me to express my

thanks in words, and in doing so I must ask for your kind indulgence, for I have to say not what I want, but what I can. The events of the past two days have more than rewarded me for any services which it has been my good fortune to render to this Society. I little thought when I first became a member of the Council, twenty-seven years ago, that I was destined to be the recipient of so great an honour as you have conferred upon me on this occasion. It is now eighteen years ago since Sir Brandreth Gibbs resigned the office of Honorary Director. It was with much surprise that I was then asked to undertake the duties which he had performed so long and so well. It was, however, with much hesitation and many misgivings that I entered on the task, for I felt how difficult it would be adequately to fill his place, and how much any efforts of my own would suffer in comparison with his. In accepting that post, I was sustained by a determination to do my duty to the best of my ability, and to trust to the generosity and goodwill of the Society to excuse and cover my deficiencies. I think I may say that this occasion has justified my confidence. You have shown me most fully that you recognise that I have honestly tried to do my best, and that you have condoned the mistakes that I have made from time to time, and of which no one is more conscious than myself. When I look back upon my eighteen years of service as Honorary Director, I can see many things that I could have done better, many that I wish I had done differently, many that I wish I had left undone. In all that I have done in connection with this Society, so far as my functions were concerned, my main object has been to make our annual shows worthy of the dignity of British agriculture, and representative of the greatness of the Royal Agricultural Society of England. (Cheers.) I have never regretted undertaking the post. It has often been a toil, but never a labour. Work ceases to be a labour when one finds skilful and devoted co-operation, and is met on all sides with unvarying good temper and goodwill. It becomes pleasure when one can look forward to a verdict lenient to one's errors, and generous—aye, too generous—to one's successes. All this has been my lot. No one could have been more fortunate than I in respect of those with whom it has been my fortune to serve this Society. I would refer in the first place to our late friend, Mr. Jenkins, who, as Secretary, assisted me in the early days of my appointment with his great experience and ability. Of his successor—Mr. Clarke—I feel that I cannot say in his presence all that I could and would say behind his back; but I desire to bear testimony to the singular rapidity with which he has grasped the intricate working of this Society, and the great power and energy with which he has always served the Society in general, and assisted me in particular, for which I shall ever feel grateful. (Cheers.) There is one other official of the Society with whom I have been more particularly brought in contact, and whom I desire to mention, and that is our Surveyor—Mr. Bennison. His merits are the less in need of any tribute from me, inasmuch as they must be patent to all who ever visited a Royal Showyard; but I must express my acknowledgment of his great resourcefulness on occasions of difficulty, and of his unvarying courtesy and kindness to myself. (Cheers.) As regards all the other officials, I venture to think that no Society could be more efficiently served than this, and I can only say that I have ever received from them the most zealous and loyal co-operation, for which I desire to tender them most hearty thanks. There is another important body which I feel I cannot forget on this occasion, viz., our exhibitors. On many occasions, unfortunately, I have had to come in conflict with their views, and to impose on them restrictions which I fear they did not greatly appreciate; but still I believe that our relations have been on the whole satisfactory, and I cannot help but think that the success of our Shows is due in no small degree to their kind co-operation. (Hear, hear.) No one can stand in the position I do to-day without comparing in his own mind the Society as it was eighteen years ago with the Society as it exists to-day. Its growth during that period is due to many causes. My duty has been to follow on that growth as it

p 2

has occurred, and to endeavour to meet its increasing needs. For all that I have been able to do, I have received a more than ample reward to-day. But it has been my good fortune that I have not had to wait until to-day for my entire reward. A part of it I have found in the work itself; a still larger part in the many friendships I have made upon my way. Many whom, in the exercise of my duties, I met as strangers have become, and still are, my good friends, while I hope and believe I have left no enemies. To my successors, whoever they may be, I can wish no better than I have received myself—your confidence, your friendship, and your approval. Highly as I shall always value this handsome gift, and the resolutions which have accompanied it, believe me, I shall prize and cherish still more the feelings of which they are the emblems. My Lord Duke, your Royal Highness, my Lords and Gentlemen, once more I beg to thank you. (Loud cheers.)

Mr. MARTIN J. SUTTON asked permission, on behalf of both the stock and implement exhibitors, to express their great esteem and admiration for Sir Jacob Wilson. He happened to be both a stock exhibitor and an implement exhibitor, and he could say that in all the years during which Sir Jacob Wilson had been Honorary Director they had never once received from him an unkind word or expression.

Election of Auditors.

Mr. WILLIAM C. BOOTH then moved a vote of thanks to the Auditors (Messrs. A. H. Johnson and C. Gay Roberts) for their services during the past year, and proposed the re-election of Messrs. Johnson and Roberts, and the election of Mr. S. B. L. Druce, in the room of Mr. Sherborn, deceased, as Auditors for the ensuing year. Mr. Druce had been connected with the Society through his father and grandfather since the year 1846, and no man, perhaps, was better known in the agricultural world than Mr. Druce himself for eminent services rendered.

Mr. THOMAS BELL seconded, saying he had always found Mr. Druce one of the best and most obliging of men.

The motion having been carried unanimously,

The PRESIDENT put the usual inquiry as to whether any member present had any remark to make, or suggestions to offer, for the consideration of the Council.

Agricultural Education.

Dr. HENRY J. WEBB brought forward the question of agricultural education in the proposed new University for London, and said he was sure that the Royal Commissioners would wish to have the opinion of the Royal Agricultural Society upon the subject. Several of his best students had left to go to Edinburgh simply because in Scotland they could get a degree in Agriculture, whereas in England they were not able to do so.

The PRESIDENT promised that this matter should receive the attention of the Council.

Vote of Thanks to Chairman.

H.R.H. Prince CHRISTIAN moved a vote of thanks to the Duke of Westminster for presiding on this occasion, which he felt confident they would cordially support, particularly in view of the way in which His Grace had presented the testimonial to Sir Jacob Wilson. He was quite sure it could not have been done in more appropriate terms, and that the feelings and sentiments of all present could not possibly have been better expressed.

Mr. CHARLES E. ASHWORTH seconded the motion, which was carried unanimously.

The PRESIDENT said he was very much obliged to them for their vote of thanks, and expressed the great pleasure he felt at having the honour of being President of this great Society. Soon, he hoped, they would be better housed than they were at present. Everyone would be very glad to see the portrait of his distinguished friend (Sir Jacob Wilson) as one of the first to be hung on the walls of the new building. He should be glad to join with any other gentlemen in arranging for this. (Hear, hear.)

The proceedings then terminated.

PRIZE LIST

FOR

CHESTER MEETING, JUNE 17 to 23, 1893.

Total value of Prizes offered (exclusive of Champion Prizes and Medals offered by Breed Societies), £6,357 10*s*., of which amount £1,428 are contributed by the Chester Local Committee.

HORSES (£1,555).

HUNTERS.

Class		Prizes 1st £	2nd £	3rd £
1	Mare (with foal at foot), up to 15 st. and upwards	20	10	5
2	Mare (with foal at foot), up to between 12 and 15 st.	20	10	5
3	Mare or Gelding, up to 15 st., foaled 1887 or '88 [1]	20	10	5
4	Mare or Gelding, up to 12 st., foaled 1887 or '88 [1]	20	10	5
5	Mare or Gelding, foaled in 1889 [1]	20	10	5
6	Gelding, foaled in 1890 [1]	20	10	5
7	Gelding, foaled in 1891 [1]	20	10	5
8	Filly, foaled in 1890	15	10	5
9	Filly, foaled in 1891	15	10	5
10	Filly, foaled in 1892	15	10	5

CLEVELAND BAYS.

Class		1st £	2nd £	3rd £
11	Stallion, foaled in 1890 or 1891	15	10	5
12	Mare and Foal	15	10	5

COACH HORSES.

Class		1st £	2nd £	3rd £
13	Stallion, foaled in 1890 or 1891	15	10	5
14	Mare and Foal	15	10	5

HACKNEYS.

Class		1st £	2nd £	3rd £
15	Stallion, foaled in 1890, above 15 hands	15	10	5
16	Stallion, foaled in 1890 above 14 hands and not over 15 hands	15	10	5
17	Stallion, foaled in 1891	15	10	5
18	Mare and Foal, above 15 hands	15	10	5
19	Mare and Foal, above 14 and not over 15 hands	15	10	5
20	Mare or Gelding, above 14 hands, up to 15 stones, foaled in 1887, '88, or '89 [1]	15	10	5
21	Mare or Gelding, above 14 hands, up to 12 stones, foaled in 1887, '88, or '89 [1]	15	10	5

Two Champion Gold Medals are offered by the Hackney Horse Society for the best Hackney Stallion and the best Hackney Mare.

PONIES.

Class		1st £	2nd £	3rd £
22	Stallion, not over 14 hds.	15	10	5
23	Mare and Foal, not exceeding 14 hands	15	10	5

WELSH MOUNTAIN PONIES.

Class		Prizes 1st £	2nd £	3rd £
24	Stallion not exceeding 12½ hands [1]	10	5	–
25	Mare or Gelding not exceeding 12½ hands [1]	10	5	–

HARNESS HORSES AND PONIES

Class		1st £	2nd £	3rd £
26	Mare or Gelding, of any age, above 14 hands [1]	15	10	5
27	Mare or Gelding, of any age, not over 14 hands [1]	15	10	5

SHIRE.

Class		1st £	2nd £	3rd £
28	Stallion, foaled in 1890	20	10	5
29	Stallion, foaled in 1891	20	10	5
30	Stallion, foaled in 1892	20	10	5
31	Mare and Foal	20	10	5
32	Filly, foaled in 1890	15	10	5
33	Filly, foaled in 1891	15	10	5
34	Filly, foaled in 1892	15	10	5

Two Champion Gold Medals are offered by the Shire Horse Society for the best Shire Stallion and Mare or Filly.

CLYDESDALE.

Class		1st £	2nd £	3rd £
35	Stallion, foaled in 1890	20	10	5
36	Stallion, foaled in 1891	20	10	5
37	Stallion, foaled in 1892 [1]	15	10	5
38	Mare and Foal	20	10	5
39	Filly, foaled in 1890	15	10	5
40	Filly, foaled in 1891	15	10	5
41	Filly, foaled in 1892 [1]	15	10	5

SUFFOLK.

Class		1st £	2nd £	3rd £
42	Stallion, foaled in 1890	20	10	5
43	Stallion, foaled in 1891	20	10	5
44	Mare and Foal	20	10	5
45	Filly, foaled in 1890	15	10	5
46	Filly, foaled in 1891	15	10	5

AGRICULTURAL.

Class		1st £	2nd £	3rd £
47	Gelding, foaled in 1889, by a Stallion regd. in Shire Horse Stud Book [1]	15	10	5
48	Gelding, foaled in 1890, by a Stallion regd. in Shire Horse Stud Book [1]	15	10	5
49	Gelding, foaled in 1891, got by a Stallion regd. in Shire Horse Stud Book [1]	15	10	5

[1] Offered by the Chester Local Committee.

CATTLE (£1,947).

SHORTHORN.

Class		1st £	2nd £	3rd £
50	BULL, calved 1888, '9, or '90	15	10	5
51	BULL, calved in 1891 .	15	10	5
52	BULL, calved in 1892 .	15	10	5
53	COW, in-milk or in-calf, calved previously to 1890	15	10	5
54	HEIFER, in-milk or in-calf, calved in 1890 . .	15	10	5
55	HEIFER, calved in 1891 .	15	10	5
56	HEIFER, calved in 1892 .	10	5	–

Two Champion Prizes of £20 each are offered by the Shorthorn Society of Great Britain and Ireland for the best Male and the best Female Shorthorn.

HEREFORD.

Class		1st £	2nd £	3rd £
57	BULL, calved 1888, '9, or '90	15	10	5
58	BULL, calved in 1891 .	15	10	5
59	BULL, calved in 1892 .	15	10	5
60	COW, in-milk or in-calf, calved previously to 1890.	15	10	5
61	HEIFER, in-milk or in-calf, calved in 1890 . .	15	10	5
62	HEIFER, calved in 1891 .	15	10	5
63	HEIFER, calved in 1892 .	10	5	–

DEVON.

Class		1st £	2nd £	3rd £
64	BULL, calved 1888, '9, or '90	15	10	5
65	BULL, calved in 1891 .	15	10	5
66	BULL, calved in 1892 .	10	5	–
67	COW OR HEIFER, in-milk or in-calf, calved previously to or in 1890 .	15	10	5
68	HEIFER, calved in 1891 .	15	10	5
69	HEIFER, calved in 1892 .	10	5	–

SUSSEX.

Class		1st £	2nd £	3rd £
70	BULL, calved 1888, '9, or '90	15	10	5
71	BULL, calved in 1891 .	15	10	5
72	BULL, calved in 1892 .	10	5	–
73	COW OR HEIFER, in-milk or in-calf, calved previously to or in 1890 .	15	10	5
74	HEIFER, calved in 1891 .	15	10	5
75	HEIFER, calved in 1892 .	10	5	–

WELSH.

Class		1st £	2nd £	3rd £
76	BULL, calved 1888, '9, or '90	15	10	5
77	BULL, calved in 1891 .	15	10	5
78	BULL, calved in 1892 .	10	5	–
79	COW, in-milk or in-calf, calved previously to 1890	15	10	5
80	HEIFER, in-milk or in-calf, calved in 1890 [1] . .	15	10	5
81	HEIFER, calved in 1891 .	15	10	5
82	HEIFER, calved in 1892 .	10	5	–

Two Champion Cups value 20 Guineas each are offered by the Chester Local Committee for the best Male and the best Female animal exhibited in Classes 76–82.

RED-POLLED.

Class		1st £	2nd £	3rd £
83	BULL, calved 1888, '9, or '90	15	10	5
84	BULL, calved in 1891 .	15	10	5
85	BULL, calved in 1892 .	10	5	–
86	COW OR HEIFER, in-milk or in-calf, calved previously to or in 1890 .	15	10	5
87	HEIFER, calved in 1891 .	15	10	5
88	HEIFER, calved in 1892 .	10	5	–

Two Champion Prizes of £10 each are offered by the Red-Polled Society for the best Male and the best Female animal exhibited in Classes 83–88.

ABERDEEN ANGUS.

Class		1st £	2nd £	3rd £
89	BULL, calved 1888, '9, or '90	15	10	5
90	BULL, calved 1891 or 1892	15	10	5
91	COW OR HEIFER, in-milk or in-calf, calved previously to or in 1890 .	15	10	5
92	HEIFER, calved in 1891 or 1892	15	10	5

GALLOWAY.

Class		1st £	2nd £	3rd £
93	BULL, calved 1888, '9, or '90	15	10	5
94	BULL, calved in 1891 or '92	15	10	5
95	COW OR HEIFER, in-milk or in-calf, calved previously to or in 1890 .	15	10	5
96	HEIFER calved in 1891 or 1892	15	10	5

AYRSHIRE.

Class		1st £	2nd £	3rd £
97	BULL, calved in 1890, 1891, or 1892	10	5	–
98	COW OR HEIFER, in-milk or in-calf. . . .	10	5	–

JERSEY.

Class		1st £	2nd £	3rd £
99	BULL, calved in 1889, 1890, or 1891 . . .	15	10	5
100	BULL, calved in 1892 .	10	5	–
101	COW, in-milk, calved previously to or in 1889 .	15	10	5
102	COW, in-milk, calved in 1890	15	10	5
103	HEIFER, in-milk or in-calf, calved in 1891 .	15	10	5
104	HEIFER, calved in 1892 .	10	5	–

GUERNSEY.

Class		1st £	2nd £	3rd £
105	BULL, calved in 1889, 1890, or 1891 . . .	15	10	5
106	BULL, calved in 1892 .	10	5	–
107	COW OR HEIFER, in-milk, calved previously to or in 1890	15	10	5
108	HEIFER, calved in 1891 .	15	10	5
109	HEIFER, calved in 1892 .	10	5	–

[1] Offered by the Chester Local Committee.

CATTLE—*continued.*

KERRY.

Class		Prizes 1st £	2nd £	3rd £
110	Bull, calved in 1890, 1891, or 1892	10	5	–
111	Cow, in-milk or in-calf, calved previously to or in 1890	10	5	–
112	Heifer, calved in 1891 or 1892 [1]	10	5	–

DEXTER KERRY.

113	Bull, calved in 1890, 1891, or 1892	10	5	–
114	Cow, in-milk or in-calf, calved previously to or in 1890	10	5	–
115	Heifer, calved in 1891 or 1892 [1]	10	5	–

DAIRY CATTLE.

Class		Prizes 1st £	2nd £	3rd £
116	A. Cow, 1,100 lb. or over, live weight, yielding largest quantity of Butter by test of the churn	15	10	5
116	B. Cow, under 1,100 lb live weight, yielding largest quantity of Butter by test of the churn	15	10	5

A Champion Prize of £25 is offered by the English Jersey Cattle Society for the Cow in Classes 116 A and 116 B yielding the largest quantity of Butter in proportion to her live-weight.

117	Cow, in-milk, whose last calf was born before March 19, 1893 [1]	20	15	10
118	Cow, in-milk, whose last calf was born on or after March 19, 1893 [1]	20	15	10
119	Cow, in-milk, calved in 1890 [1]	20	15	10
120	Heifer, in-calf, calved in 1891 [1]	15	10	5
121	Heifer, calved in 1892 [1]	15	10	5

SHEEP (£1,105).

LEICESTER.

122	Two-Shear Ram	10	5	–
123	Shearling Ram	15	10	5
124	Pen of Three Ram Lambs, dropped in 1893	10	5	–
125	Pen of Three Shearling Ewes of the same flock	15	10	5

COTSWOLD.

126–129 Same as for Leicester

LINCOLN.

130–133 Same as for Leicester

OXFORD DOWN.

134–137 Same as for Leicester

SHROPSHIRE.

138	Two-Shear Ram	10	5	–
139	Shearling Ram	15	10	5
140	Pen of Five Shearling Rams of the same flock [1]	20	15	5
141	Pen of Three Ram Lambs, dropped in 1893	10	5	–
142	Pen of Three Shearling Ewes of the same flock	15	10	5

SOUTHDOWN.

143–146 Same as for Leicester

HAMPSHIRE DOWN.

147–150 Same as for Leicester

SUFFOLK.

151–154 Same as for Leicester

WENSLEYDALE.

155	Shearling Ram	10	5	–
156	Pen of Three Ram Lambs, dropped in 1893	10	5	–
157	Pen of Three Shearling Ewes of the same flock	10	5	–

BORDER LEICESTER.

158	Ram, Two-Shear and upwards	10	5	–
159	Shearling Ram	10	5	–
160	Pen of 3 Shearling Ewes of the same flock	10	5	–

SOMERSET AND DORSET HORN.

161	Shearling Ram	10	5	–
162	Pen of 3 Ram Lambs, dropped after Dec. 1, 1892	10	5	–
163	Pen of 3 Shearling Ewes of the same flock	10	5	–

KENTISH OR ROMNEY MARSH

164	Shearling Ram	10	5	–
165	Pen of 3 Shearling Ewes of the same flock	10	5	–

CHEVIOT.

166 & 167 Same as Kentish or Romney Marsh

BLACK-FACED MOUNTAIN.

168 & 169 Same as Kentish or Romney Marsh

LONK.

170 & 171 Same as Kentish or Romney Marsh

HERDWICK.

172 & 173 Same as Kentish or Romney Marsh

WELSH MOUNTAIN.

174	Ram, Two-Shear and upwards [1]	10	5	–
175	Shearling Ram	10	5	–
176	Pen of Three Ewes (Two-Shear and upwards) of the same flock [1]	10	5	–
177	Pen of 3 Shearling Ewes, of the same flock	10	5	–

[1] Offered by the Chester Local Committee.

PIGS (£432).

Classes		
178—181	Large White	For Prizes see below
182—185	Middle White	
186—189	Small White	
190—193	Berkshire	
194—197	Any Other Black Breed	
198—201	Tamworth	

In each of the above breeds the following prizes will be given:—

	1st £	2nd £	3rd £
Boar, farrowed in 1892	10	5	3
Pen of Three Boar Pigs, farrowed in 1893	10	5	3
Breeding Sow, farrowed previously to or in 1892	10	5	3
Pen of Three Sow Pigs, farrowed in 1893	10	5	3

POULTRY (£261 10*s*.).

Prizes are offered for the best Cock, Hen, Cockerel, and Pullet respectively, of each of the following Breeds:—

Classes		*s.*	*s.*	*s.*
202—205	Dorking, Coloured	30	15	10
206—209	Dorking, Silver Grey	30	15	10
210—213	Dorking, White or any other variety	30	15	10
214—217	Game, Old English	30	15	10
218—221	Game, Indian	30	15	10
222—225	Houdan	30	15	10
226—229	Other French	30	15	10
230—233	Brahma	30	15	10
234—237	Cochin	30	15	10
238—241	Langshan	30	15	10
242—245	Wyandotte	30	15	10
246—249	Plymouth Rock	30	15	10
250—253	Minorca	30	15	10
254—257	Andalusian	30	15	10
258—261	Leghorn	30	15	10
262—265	Hamburgh	30	15	10
266—269	Any other recognised breed except Bantams	30	15	10

Table Poultry.

270	Pair of Cockerels of 1893, of any pure breed	30	15	10
271	Pair of Pullets, ditto	30	15	10
272	Pair of Cockerels of 1893, 1st cross from pure breeds	30	15	10
273	Pair of Pullets, ditto	30	15	10

Prizes are offered for the best Drake, Duck, Young Drake, and Duckling respectively of each of the following Breeds:—

274—277	Aylesbury	30	15	10
278—281	Rouen	30	15	10
282—285	Pekin	30	15	10
286—289	Any other Useful Breed	30	15	10

Table Ducklings.

290	Pair of Ducklings of 1893, of any pure breed	30	15	10
291	Pair of Ducklings of 1893, 1st cross from pure breeds	30	15	10
		£	£	*s.*
292	Gander	2	1	10
293	Goose	2	1	10
294	Turkey Cock	2	1	10
295	Turkey Hen	2	1	10

PRODUCE (£826).

CHEESE.

Class	CHESHIRE CHEESE.	1st £	2nd £	3rd £	4th £
296	3 Cheeses (coloured or Uncoloured), of not less than 60 lb. each, made in 1892[1]	25	15	10	5
297	3 Cheeses (Coloured or Uncoloured), of not less than 30 lb., and under 60 lb. each, made in 1892[1]	25	15	10	5
298	3 Coloured Cheeses, of not less than 60 lb. each, made in 1893[1]	25	15	10	5
299	3 Coloured Cheeses, of not less than 40-lb. each, and under 60-lb., made in 1893[1]	25	15	10	5
300	3 Coloured Cheeses, under 40 lb. each, made in 1893[1]	20	10	5	3
301	Three Uncoloured Cheeses, of not less than 50 lb. each, made in 1893[1]	25	15	10	5
302	Three Uncoloured Cheeses, under 50 lb. each, made in 1893[1]	25	15	10	5
303	Three Uncoloured Cheeses, under 40 lb. each, made in 1893[1]	20	10	5	3

A Champion Prize of £100 *for the three best Cheshire Cheeses entered in Classes 296 to 303 is offered by the Chester Local Committee.*

(No Entry will be required for this Prize, as the Cheeses to which it will be awarded will be selected from those entered for Prizes in Classes 296 to 303.)

PRIZES TO DAIRY-MAIDS AND CHEESE-MAKERS.

In addition to the above, a Prize of £3 is offered by the Chester Local Committee to the Dairy-maid or other person who shall have made the Dairy of Cheeses winning the First Prize in each of the above Classes, 296–303, and £10 to the Dairy-maid or other person who shall have made the Dairy of Cheeses winning the Champion Prize. No Dairy-maid or Cheese-maker can take more than one Class Prize.

[1] Offered by the Chester Local Committee.

PRODUCE—*continued.*

CHEDDAR CHEESE.

		Prizes 1st £	2nd £	3rd £
304	3 Cheddar Cheeses, of not less than 50 lb. each, made in 1892	10	5	3
305	3 Cheddar Cheeses, of not less than 50 lb. each, made in 1893	10	5	3

STILTON CHEESE.

		1st £	2nd £	3rd £
306	3 Stilton Cheeses, made in 1892	5	3	2
307	3 Stilton Cheeses, made in 1893	5	3	2

OTHER VARIETIES OF CHEESE.

		1st £	2nd £	3rd £
308	3 Double Gloucester Cheeses, made in 1893	5	3	2
309	3 Leicester Cheeses, made in 1893	5	3	2
310	3 North Wilts Loaf Cheeses, made in 1893	5	3	2
311	3 Lancashire Toasting Cheeses, made in 1893	5	3	2
312	3 Cheeses, not eligible for any of the previous Classes, made in 1893	5	3	2
313	3 Small Cheeses, under 2-lb. weight each	3	2	1
314	3 Cream Cheeses	3	2	1

BUTTER.

315 2 lb. Fresh Butter, slightly salted, made up in pounds { Four of 5*l.* each; Four of 3*l.* each; Four of 1*l.* each }

316 One Keg or other Package of Salt Butter, not less than 14 lb. & under 40 lb., 1st 5*l.*, 2nd 3*l.*, 3rd 2*l.*

317 One Keg or other Package of Salt Butter, not less than 40 lb, 1st 5*l.*, 2nd 3*l.*, 3rd 2*l.*

CIDER AND PERRY.

		1st £	2nd £	3rd £
318	Cask of Cider, made 1892	5	3	2
319	One Doz. Cider, made 1892	5	3	2
320	One Doz. Cider, made before 1892	5	3	2
321	One Doz. Perry	5	3	2

JAMS AND PRESERVED FRUITS.

		Prizes 1st £	2nd £	3rd £
322	Whole-Fruit Jams	3	2	1
323	Bottled Fruits	3	2	1
324	Preserved Fruits for Dessert	3	2	
325	Collection of Preserved Peas, French Beans, Tomatoes & Mushrooms, for Cooking purposes	3	2	1
326	Dried or Evaporated Fruits & Vegetables for Cooking	3	2	1
327	Air-tight receptacle for Jams, Preserved Fruits, Vegetables, &c,	3	2	1

HIVES, HONEY, &c.

Offered by British Bee-keepers' Association.

		Prizes 1st *s.*	2nd *s.*	3rd *s.*
328	Collection of Hives &c.	100	50	–
329	Observatory Hive	30	20	–
330	Frame Hive	20	15	10
331	Frame Hive for Cottager's use	20	15	10
332	Honey Extractor	15	10	–
333	Pair of Section Racks	15	10	5
334	Rapid Feeder	10	5	–
335	Bingham Smoker	15	10	–
336	12 Sections of Comb Honey, about 12 lb.	20	10	5
337	6 Sections of Comb Honey, about 6 lb.	20	10	5
338	Run or Extracted Honey, about 12 lb.	20	10	5
339	12 Sections of Comb Honey, about 12 lb. gathered in or before 1892	20	10	5
340	3 Shallow Frames of Comb Honey	20	10	5
341	Run or Extracted Honey, about 12 lb. gathered in or before 1892	20	10	5
342	Granulated Honey, weight about 12 lb.	20	10	5
343	Display of Honey	50	30	10
344	Useful Inventions introd. since 1894.	Special Prize according to merit.		
345	Other Exhibits	Special Prize according to merit.		

IMPLEMENTS (£130).

		1st £	2nd £	3rd £
I.	Self-binding Harvester, using other binding material than wire	50	30	20
II.	Sheep-shearing Machine worked by power	20	–	–
III.	Sheep-shearing Machine (other than ordinary Shears) worked by hand or foot	10	–	–

HORSE-SHOEING COMPETITIONS (£32).

(Limited to shoeing-smiths in the Society's District G.)

Class 1. Hunters (Tuesday, June 20, and if required, Wednesday, June 21).

Class 2. Agricultural Horses (Thursday, June 22, and if required, Friday, June 23).

Prizes: 1st 6*l.*, 2nd 4*l.*, 3rd 3*l.*, 4th 2*l.*, 5th 1*l.*, in each class.

BUTTER-MAKING COMPETITIONS (£69).

Class 1. (*Tuesday, June* 20) Open to United Kingdom.

Class 2. (*Wednesday, June* 21) Female Members of a Farmer's family not in service or working for wages.

Class 3. (*Thursday, June* 22) Dairymaids and others residing in the Society's District G. (Open only to those who have not been prize-winners at previous Country Meetings of the Society.)

Class 4. (*Thursday, June* 22) Dairymaids and others, being residents in Cheshire or North Wales, who have taken instruction since Jan. 1, 1892, for a week or more in any of the following Dairy Schools :—Worleston, Macclesfield, Bangor, Denbigh, or Welshpool.

Champion Class. (*Friday, June* 23) Open only to the prize-winners in the above Classes.

Prizes: 1st 6*l.*, 2nd 4*l.*, 3rd 3*l.*, 4th 2*l.*, 5th 1*l.*, in Classes 1, 2, 3, and 4, and 5*l.* and Society's Silver Medal in the Champion Class.

Last Day of Entry for Stock, Poultry, and Produce, Monday, MAY 1, 1893. (Post Entries at Double Fees up to FRIDAY, MAY 12.)

The Regulations for these Prizes and for the Exhibition of Implements, &c. (for which entries close April 1, 1893), *can be obtained on application to the Secretary of the Society, at* 12 *Hanover Square, London, W.*

NOTICE OF ANNIVERSARY GENERAL MEETING.

Notice is hereby given that the Fifty-fourth Anniversary Meeting of Governors and Members of the Royal Agricultural Society of England will, in order to comply with Clause 6 of the Charter, be held *pro formâ* on Monday, May 22, 1893 (Whit Monday), at noon, but will then be immediately adjourned until the following **Monday, May 29, 1893,** at noon, when the half-yearly Report of the Council will be read, and the election of the President, Trustees, and Vice-Presidents, and of twenty-five Members of Council, will take place.

Ernest Clarke,
Secretary.

December, 1892.